ELECTRICAL REVIEW

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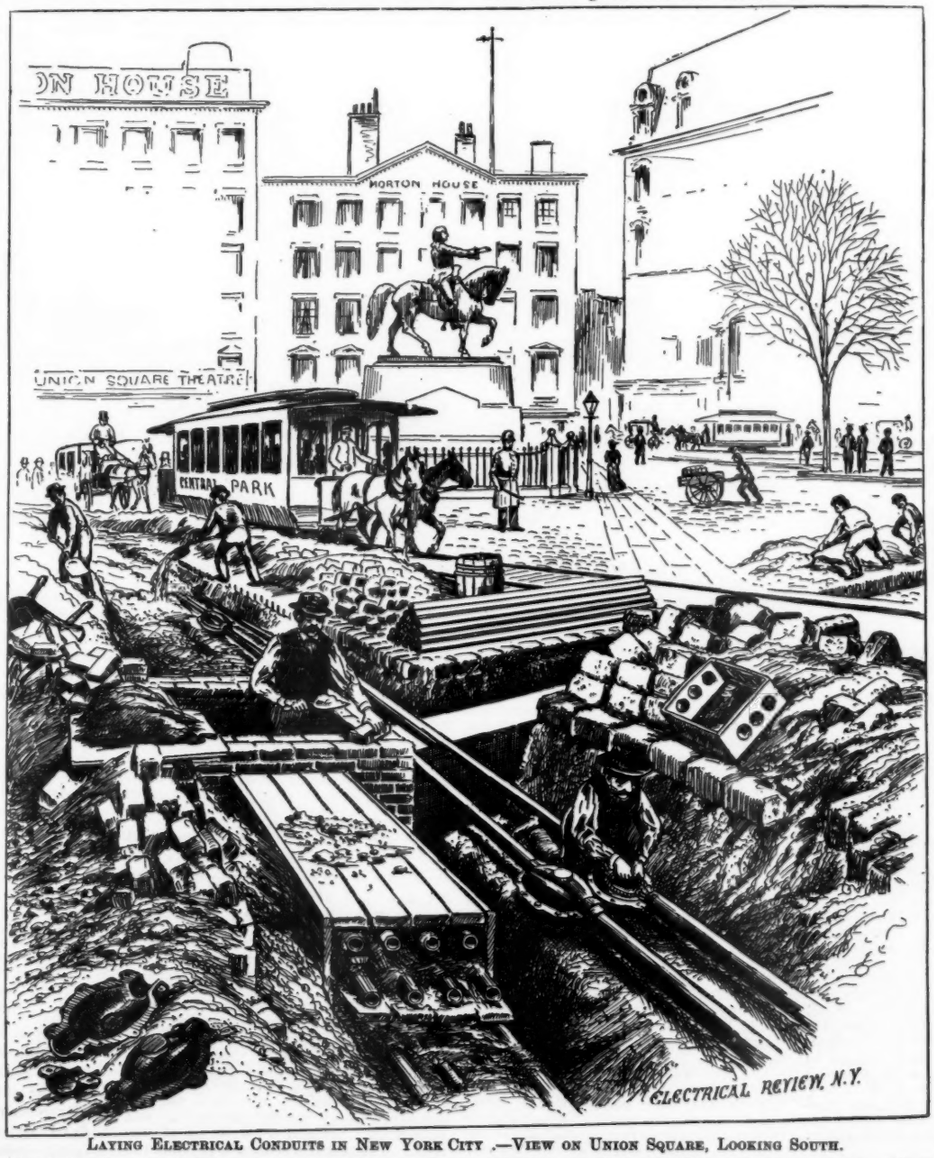
Underground Electrical Work in New York.

There has been considerable hustling in this city by the electric light and power companies during the past few weeks, to get down as much underground work as possible before Manhattan Island becomes solidified by frost.

The underground workmen, to a great extent, have been preceding Commissioner Gilroy's men who are paving a number of down-town streets. The Commissioner has made a rule, and a good one for the city, too, not to allow the newly paved streets to be torn up for any purpose whatever.

In all parts of the city great activity in underground construcion has been shown during the past year, both in building subways and laying conduits. Our illustration on this page is of a typical nature, showing the conduits along one side of Union Square in process of construction. These are placed about three or four feet under the surface, and about the same distance from the curb. At a recent meeting of the Board of Electrical Control it was suggested that where it was desired to lay conduits along a newly paved street, the space under the sidewalk be utilized instead of tearing up the street. This would hardly seem to be feasible, owing to the large number of cellars which extend clear out to the curb beneath the sidewalk.



Laying Electrical Conduits in New York City.—View on Union Square, Looking South.

Still Too High.

The Board of Electrical Control held a meeting at the Mayor's office on December 4th. Six electric lighting companies submitted bids for arc electric lamps for lighting the city. The bids averaged about 44 cents per lamp per night, which the Gas Commission considered excessive. A resolution offered by Comptroller Myers that the bids be rejected because of the high rate was discussed, but it was concluded to wait until the bids are tabulated. Each bid is from two to three cents higher than last year's. The companies assert that the use of the subways entails extra expense.

Distribution of Power by Hydraulic Pressure.

M. Van Rysselberghe has built a small plant at Antwerp for demonstrating his plan of distribution of power by hydraulic pressure, which is caused to operate turbine wheels coupled direct to dynamo electric machines. We extract the following from a London contemporary:

The installation is situated at the hydraulic station connected with the Antwerp dock locks, and cranes and water at 40 atmospheres pressure is obtainable. The turbine devised by M. Van Rysselberghe is of the "hydraulic tourniquet" description, and is coupled to a four-pole Victoria machine, the spindle of which is vertical. At full load seven electrical horse-power are given out by the dynamo for every 16 horse-power supplied to the hydraulic motor. The speed is kept very constant at 650 revolutions by an automatic governor which regulates the admission of water. The hydraulic motor consumes three litres of water per 16 horse-power per second, and as the price of it is .1*d.* per cubic metre, the cost of the horse-power hour at the dynamo terminals is about 2*d.* The dynamo supplies current to the four arcs and 150 incandescents employed in lighting the hydraulic station.

Patent Office Figures.

The annual report of Secretary Noble, of the Department of the Interior, makes a volume of 127 large pages. Under the heading of "The Patent Office," the following information is given: The total number of applications received, including re-issues, trade-marks, designs, etc., was 46,140; the number of patents granted was 25,857; trade-marks and labels registered, 1,696; patents expired, 11,885; the total receipts were $1,847,303.21; the total expenditures were $1,081,173.56; leaving a surplus of $266,029.65 to be turned into the Treasury of the United States to the credit of the patent fund, and making a total balance in the Treasury on account of the patent fund of $3,790,556.28.

The Telephone and Provincialisms.

"Did it ever occur to you," said a telephone man to a Washington *Star* reporter, "that the telephone may have an important effect upon language? Up in Quebec, you know, operators must speak both English and French. It was discovered in Milwaukee that when a subscriber speaking English was disturbed by 'cross-talk,' also in English, from another wire, a shift to the German tongue remedied the difficulty. Now, as to the effect of the telephone on language, let me illustrate: The other day I called for Washington. Presently there was a reply, and for the moment, of course, I could not be sure from what point the answer came. But when I heard a soft feminine voice say 'Baltimah,' I felt pretty sure that the operator in Washington was speaking. Now, suppose the use of long-distance telephoning became so general that people in any part of the United States were in daily communication with their fellow-citizens in all other parts of the country, don't you fancy that we should gradually get rid of provincialisms in speech?"

The Telegraph in Manitoba.

The Great Northwestern Telegraph Company now reaches Brandon, Manitoba, by the wires along the Morris-Brandon branch. Formerly its line ran by Portage la Prairie, Minnedosa and Rapid City to Brandon. A short time ago the M. & N. W. Railway acquired the line from Portage la Prairie to Rapid City, and as they already had two lines between those points, they took it down and used it in extending their main line to Yorkton. The C. P. R. system works directly over the M. & N. W. as far as Yorkton.

In the Territories the chief work has been building the line to Prince Albert. At Saskatoon this line connects with the government system of telegraphs. A fourth heavy wire has been strung from Brandon to Donald, and will be carried through to the coast next year.

The Washington Construction Company, 1225 F street, N. W., Washington, after January 1, will be located in larger and better quarters at 609 Twelfth street, N. W., Washington, D. C.

OUR LONDON LETTER.

The Lord Mayor's Show and the Guildhall.—At the banquet at the Guildhall, which followed the Lord Mayor's Show of the 10th inst., electric lighting was for the first time introduced into the building. The Brush Electrical Engineering Corporation had, with very short notice, fixed 500 incandescent lamps to the gasoliers above the tables in the dining hall, and the result was most successful, and the effect produced everything that could be desired.

St. Pancras Vestry Central Station.—The foundation stone of the proposed new building was laid a few days ago. Professor Henry Robinson, Q.I.C.E., the engineer, gave some particulars in regard to the installation, and stated that if the results are as satisfactory from a commercial point as are anticipated, further stations to cover the whole of the district will follow. He had adopted the continuous current system, fixing the E. M. F. at 110 volts to suit the incandescent lamps. The system on which the mains are laid is that known as the three-wire system, enabling current to be transmitted from the central station at 220 volts along the outside wires, the third wire being kept at an intermediate potential. The lamps are in connection with one of the outside wires as well as with the third wire just mentioned. Should there be a greater demand on one side than the other, a further supply will be obtained from the central station along the third wire. In addition to the supply of 110 volts for incandescent lamps by this arrangement, current for motive power or arc lamps can be supplied at 220 volts. Provision is made at the outset for five miles of distributing mains, carrying current for 25,000 incandescent lamps of 16 c. p. in use simultaneously, and there are separate mains provided for the public street lighting. The chairman of the Electricity Committee, Mr. Andrew Sweet, in moving a vote of thanks to the church wardens, said the estimated cost of the works would be £55,000, which it was proposed to borrow from the County Council at 3½ per cent., the principal and interest to be paid off in 42 years. The private companies charged 8*d*. per unit, but at a very moderate computation, and supplying the light at 6*d*. per unit, he anticipated with the greatest confidence a yearly income upon capital outlay of 20 per cent. Whether this hope be fully justified or not, the inhabitants of St. Pancras will still owe a debt of gratitude to the vestry authorities for leading so good an example to the other vestries of the metropolis, and for giving them the best possible lighting up to the present time discovered.

The German Exhibition at Earlscourt in 1891.—The Advisory Council held its first meeting last week, at the Deutsche Bank, George Yard, Lombard street, London, Mr. Otto von Ernsthausen being in the chair.

Mr. Wilson Barrett's New Theatre.—Electric light is to be solely used behind the scenes of this theatre, gas being entirely dispensed with.

Personal.—Mr. Magnus Volk having completed the fitting out of the electric launches on the Thames for the General Power and Traction Company (late Messrs. Immisch & Company), has now terminated his connection with that company and is engaged in completing some new types of electrical measuring instruments.—Mr. A. W. Jones, lately the chief electrician to the Exeter Electric Light Company, has now joined the Laing, Wharton & Down Construction Syndicate.

Elmore's French Patent Copper Depositrix Company.—The services of M. Eugene Secretan, formerly connected with the Comptoir D'Escompte, have now been secured by this company, and in order to carry out his larger views as to scope for operations, a further issue of £50,000 of debentures is announced. The parent company, Elmore's Foreign and Colonial Patent Copper Depositrix Company, Limited, offers to supply the amount of £50,000, six per cent. debentures at par and redeemable on 1st November, 1893, at £105. Over seven and a half per cent. is a heavy price to pay upon a first mortgage security, however.

Edinburgh International Exhibition.—The exhibition closed on the 1st inst., and the number of visitors in the six months it has remained open was nearly 2½ millions. On the closing day there was an attendance of over 23,000, and owing to the non-payment of some electric lighting account, the electric light was not turned on until nearly 6 o'clock, the various stalls being forced to remain in darkness or to use candles. In the course of the evening, the chairman of the executive council, Sir Thomas Clark, addressed a large meeting in the grand hall, and while regretting the unfortunate financial condition of the exhibition, said that, as affording the public an excellent means of instruction and entertainment, the exhibition had been a very great success. Referring to the electrical section, it was one of the most wonderful displays of inventions ever brought together at any exhibition. As there is already a deficit of £25,000, it was resolved to wind up the association voluntarily, Mr. G. A. Robertson, chartered accountant, being appointed liquidator. A regretable climax to a series of unfortunate incidents occurred last Saturday, when Mr. Lee Bapty, the general manager, was arrested at the Waverly station, Edinburgh, on a warrant to prevent him from leaving the country until he had either paid or found a security for his £500 contribution to the exhibition guarantee fund. Mr. A. Mackenzie Ross, the exhibition refreshment contractor, became security at the sheriff's court, and Mr. Bapty was at once set free and is now on his way to Jamaica to manage the exhibition shortly to be opened there.

Award.—For their carbon exhibit in the French electrical section of the Edinburgh Exhibition, Messrs. Lacombe & Company have been awarded a gold medal.

Siemens & Halske.—It is stated from Vienna that the Anglo Bank is negotiating for the taking over of the electrical undertaking which the above Berlin firm owns in Vienna, as well as the firm's electric railway at Pesth.

Mr. F. B. Lea's Pamphlet on "Electricity in Every Day Life."—Mr. Frank B. Lea, B.A., A.T.E.E., has just issued a very excellent little pamphlet telling in a concise form the reasons why electricity should be adopted as a motive power and for lighting purposes, and also describing the various apparatus employed for producing and distributing it. There are a number of capital illustrations, the interior of an electrically lighted house, central station, dynamos, search-lights, various uses of motors, launches, an electric crane, a telephone line and electric tramcars, showing both the overhead and the storage system. The price is two pence only, and for a plain short explanation of the various applications of electricity it can be very strongly recommended. Mr. E. W. Allen, 4 Ave Maria Lane, London, E.C., is the publisher.

The Latest News.—The National Telephone Company, Limited, have now opened to the public the trunk line between the London, Manchester, Liverpool and Birmingham Exchanges.

The London Central Railway Company.—The promoters of the London Central Railway Company have announced their intention to apply at the approaching session of Parliament for power to construct an electric railway from the terminus of the City and South London Railway, in King William street, E. C., to Queen's Road, Bayswater.

Telephonic Communication Between Paris and London.—I learn from Paris that communication will be opened on January 1, 1891.

Coblenz.—The telephone line between Cologne and Coblenz will be completed before the end of the year.

Austria.—A central station for electric lighting is to be erected at Sternberg.

London, Nov. 21. CHARLES FFRENCH.

The President's Message.

The President's annual message is always an important document of State. The people who read it in the newspapers the morning after its submission to Congress, have no idea of the vast amount of work it entails on the newspapers and the Associated Press. The message published last week contained 11,000 words. It was distributed by the Associated Press to the newspapers of the country from New York. Four hours were required for the transmission of the big message.

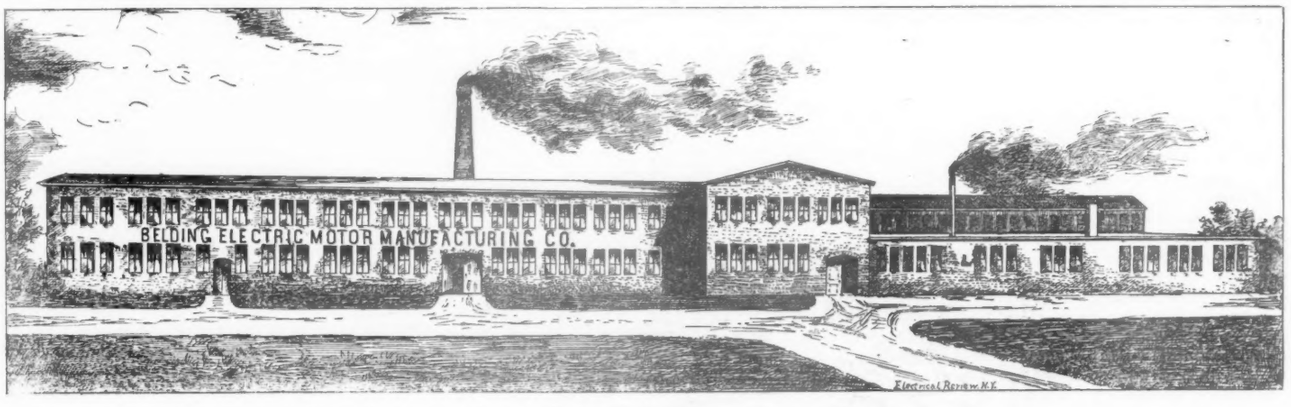
"The noticeable thing about the transmission of yesterday's message from New York to Cincinnati," says the Cincinnati *Commercial Gazette*, "was the great length of the electrical circuit. The message printed in the *Commercial Gazette* this morning went from New York to St. Paul, taking in Pittsburgh, Cleveland, Detroit, Chicago, Milwaukee, Toledo, Minneapolis and Columbus, before it was transcribed in the office of the Associated Press here. The message was transcribed on the type-writer here. Fifteen manifold copies of it were made. Seven copies were for the Cincinnati newspapers. The other eight were put on the wires for transmission to the cities not on the direct line of the Associated Press' leased wires. The Western Union transmitted the message to these cities. At Chicago, 30 manifold copies of the message were made on type-writers. It was a big job for the Associated Press operators, but they handled it accurately and expeditiously. Operators Cogley and Duey, veterans in the service of the Associated Press, received the message here, and Operators Rose and Cogan sent it over the Southwestern wires."

The Belding Electric Motor Manufacturing Company.

In a recent issue of the REVIEW a note was made of the increase in capital stock of the Belding Electric Motor Manufacturing Company and the fact that they had purchased a factory and ten acres of ground at Hermosa, Ill., on the line of the Chicago, Milwaukee and St. Paul Railroad. The accompanying cut shows the new factory, the dimensions of which are as follows: Length, 433 feet; average width, 65 feet. This, with some additions which will be built soon, will give a floor space of about 16,000 square feet. The boiler room, which at present has a capacity of 450 horse-power in boilers, is in addition to the above. A New York safety engine of 300 horse-power capacity has been placed in position and will be used to drive a large generator which will furnish current to a number of motors which will be used throughout the building. The running of the entire plant by electricity will be a novel feature.

Two thousand feet of track is being built for the testing of street car motors before shipment and for showing the working of the system.

The officers of the company are the following named gentlemen: T. G. Crosby, president; A. F. Dexter, vice-president; C. H. Bunker, secretary and treasurer; T. F. Indermille, general agent; N. S. Possons, superintendent; Harold P. Brown, electrician.



VIEW OF THE IMMENSE FACTORY OF THE BELDING COMPANY, CHICAGO.

Benjamin Franklin was Popular.

By his manners and ways of life he became the most popular man in France, so that when he gained his presentation to the king his future was assured. As he passed through the streets of Paris, he was followed by admiring eyes and cheered loudly by enthusiastic voices. A contemporary writes: "A friend of mine paid something for a place at a two-pair-of-stairs window to see him pass by in his coach, but the crowd was so great that he could but barely say he saw him." He was the Frenchman's embodiment of the ideal citizen, republican, philosopher and friend. He completely captivated and captured the people of France, whom he perfectly understood, and he well knew "that a popular man becomes soon more powerful than power itself." Condorcet said: "It was an honor to have seen him. People repeated what they heard him say. Every fête which he consented to receive, every house where he consented to go, spread in society new admirers, who became so many partisans of the American Revolution."—*December Century.*

A New Subway Company.

At a meeting of the Board of Electrical Control, in the Mayor's office, December 2d, Edward Lauterbach, the president of the Consolidated Telegraph and Electrical Subway Company, said that the persons interested in the various telegraph and telephone companies had organized a company under the title of the Empire City Subway Company. He said the object of this new company was to take charge of all the low tension subways in the city. Mr. Lauterbach mentioned the efforts made by the Standard Company to get part of the subways, and the failure of the company to comply with the conditions imposed by the Supreme Court. He promised that the new company would work legally and properly. He said that the business had grown so that it was now too large for one company to manage, and that the company be represented was willing that the new company should take charge of the low tension subways, while the arc light subways should be controlled by the old consolidated company. Mr. Lauterbach asked the Board to give its consent to the scheme of surrendering the control of the low tension subways to the new company under proper restrictions and guarantees. He submitted forms of contract. The Board promised to consider the matter.

The officials of the Whitman and Brockton, Mass., Electric Road Company have decided upon a fare for local traffic. The fare from East Whitman to Brockton will be 10 cents. The local fares will be five cents. Cars will run every half hour during the day.

Brooklyn Institute.

The department of electricity of the Brooklyn Institute met in the lecture hall of the Union for Christian Work, 67 Schermerhorn street, the evening of November 28th, a goodly representation of the members and their friends being present. President James Hamblet presided, and introduced the lecturer of the evening, Professor P. H. Van der Weyde, who gave an interesting discourse on "The History of the Telephone." Professor Van der Weyde has made a special study of the telephone and its development ever since its inception, and his talk, illustrated by several specimens of telephonic apparatus of primitive design and construction, was highly instructive as well as entertaining.

Hydraulic Jacks.

We illustrate on this page two forms of hydraulic jacks made by Watson & Stillman, 204 to 210 East Forty-third street, New York. The details of construction are as follows:

The head and interior tube or ram form a reservoir from which the filling flows to the pumps, and to which it is returned in lowering. From the pump it is forced, by the downward stroke of the piston, past the lower valve into the cylinder, and this being closed at the bottom, the ram rises to allow space for the water. The lever, which is made with a projection on one edge, slips into a socket at the side of the head. This socket passes through an arm on the interior of the head, and to this is fastened the piston of the pump. The claw attachment is a third tube, which screws into the head, below the ram-collar and outside of the cylinder, at the lower end of which is a claw projecting out at one side. The power is determined by multiplying together the weight of the operator (this is assumed to be 150 pounds), the proportions between the arm and the lever, and that of the pump and cylinder. They are rated low enough so that one man can raise the weight for which they are designed. The speed of lifting is inversely proportionate to the amount lifted. Ten tons can be lifted one foot in about a minute and a half, 100 tons in 15 minutes.

FIG. 2.—HYDRAULIC JACK.

FIG. 1.—HYDRAULIC JACK.

The jack shown in Fig. 1 is to be used where it can be placed upon the ground or a light board, and where it is possible to place it under the work for a steady lift. It is valuable in electric railway work and for use in electric light stations. The style shown in Fig. 2 is to be used when there is not room enough to get the head of the jack under the work, and is the style generally used for moving engines, boilers, machinery, and in similar work.

Awards to the Clark Electric Company.

The Clark Electric Company, Corbin Building, 192 Broadway, New York, have received a special silver medal for their automatic safety device from the American Institute Fair, which closed its annual exhibition recently. The judges on electricity visited the factory of the Clark Company and tested the safety device by cutting the electric wires and allowing them to fall on other wires. In every instance the device proved its efficiency by removing all danger. The judges also awarded the Clark Electric Company a medal of superiority for their arc lamp run on incandescent circuits. This lamp was beautifully mounted in an ornamental fixture and was much admired by the visitors to the Fair. The company are introducing this style of fixture for interior lighting, for stores, theatres, public halls, etc. They have one of their lamps in their office, 192 Broadway, running on an incandescent circuit. Mr. Clark, the electrician of the company, is an indefatigable worker, and is ever striving for new and useful electrical apparatus.

The Citizens' Electric Light and Power Company, which was granted a franchise by the city council of Cairo, Ill., some time ago, is said to have sold out its franchise to a trio of Kansas City, Mo., gentlemen, who, it is stated, are amply able to put in the plant and will do so without delay.

The city of Sprague, Wash., will issue $35,000 worth of city bonds for the purpose of purchasing electric light and water-works plants, and for refunding the debt already outstanding.

Motion of Atoms in Electrical Discharges.

BY PROF. JOHN TROWBRIDGE, OCTOBER 8, 1890.

The application of spectrum analysis to the measurement of the approach or recession of a star in a direction directly away or directly toward an observer's eye is generally regarded as one of the greatest achievements of modern science. Experiments upon the oscillatory discharge of electricity, led me to reflect whether the method which has been used in star observation might not be employed to test the question whether the atoms of the metals of the terminals between which the oscillatory discharge passes are conveyed to and fro by the oscillatory discharge, or whether they are shaken, so to speak, by the discharge, so that they emit to the ether the ripples which appeal to our senses as light and heat. No mention is made here of a convection effect which would take place too slowly to give a spectroscopic effect.

After I had made the experiments which I will shortly describe, and while I was in doubt whether to publish my results, a paper by Prof. J. J. Thomson, director of the Cavendish Laboratory, Cambridge, England, appeared in the August number of the *Philosophical Magazine*, 1890, "On the Velocity of the Transmission of Electric Disturbances," which contains the following passage: "The very rapid rate with which the electric discharge is propagated through a rare gas, compels us to admit that the electricity is not carried by charged atoms moving with this velocity. For if it were, then if the discharge were to take place in air at atmospheric pressure between two parallel plates one centimeter apart, charged to a potential difference of approximately 30,000 volts, the kinetic energy which would have to be communicated to the atoms to make them move with this velocity would be greater than the original potential energy of the charged plates, assuming that the charge on each atom is that deduced from electrolytic considerations."

The unusual dispersion afforded by a Rowland concave grating led me to test this hypothesis, in so far as it relates to the question, Are the molecules of metals carried with the oscillations of electricity between terminals between which the oscillations take place? A circuit of wire giving a suitable value of self-induction was arranged in connection with a series of Leyden jars. The time of oscillation was calculated from the well-known formula, $t=2\pi\sqrt{LC}$; in which L is the value of the self-induction of the circuit; C, the capacity of the Leyden jars. Preliminary examination of the electric spark, taken through this circuit with a revolving mirror, showed that the discharge was an oscillatory one. Two different values of self-induction were employed. One gave the duration of a double oscillation, $t=.0000003$ of a second; the other gave $t=.0000024$ of a second.

If we denote by V the velocity of light, λ and λ_1 wave lengths, δ the speed of approach of the atom, we shall have

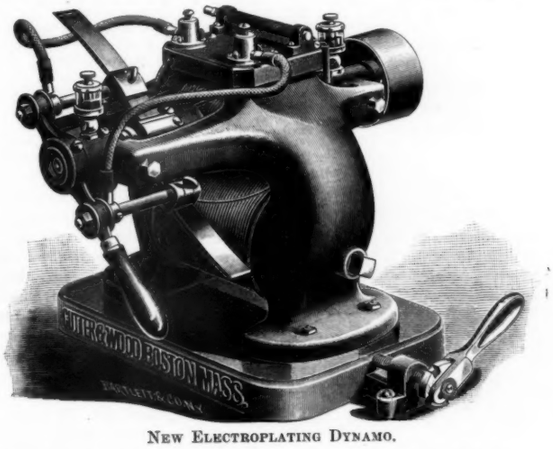
$$\lambda_1=\lambda\left(\frac{V}{V+\delta}\right).$$

The distance across which the oscillations took place was six millimeters. Calculation shows that if the iron atoms were conveyed to and fro between the terminals, a broadening of the iron lines in the spectrum would result, which could be readily detected. The broadening might amount to a space equivalent to a whole tenth meter.

The oscillatory spark passed between two iron terminals. One of these terminals was hollow. The hollow terminal was placed in a line perpendicular to the slit of the spectroscope, so that the oscillation of the spark should be toward and away from the slit. If, therefore, the iron atoms moved to and fro with the oscillations of electricity across the air gap, a displacement of the iron lines in the spectrum of the metal would result. There would be both a displacement toward the less refrangible, caused by the recession of the atom, and one toward the most refrangible end of the spectrum, caused by the approach of the atom. The great amount of dispersion afforded by a concave grating of 20,000 lines to the inch, enabled me easily to detect a movement of $\frac{1}{100}$ of a wave length. I accordingly took a photograph of the iron lines with the terminals in the position I have described, and on the same plate, immediately above this photograph, a comparison photograph was taken with the terminals parallel to the slit. In this case the iron atoms did not make their supposed excursions away and toward the slit, and, therefore, no displacement of the spectrum lines was to be expected.

The photographic plate was exposed in the neighborhood of the great H lines. A movable shutter enabled me to expose different portions of the same plate without changing any adjustments of the apparatus. The resulting photographs showed no displacement of the iron lines. The iron lines in the two photographs met exactly, continued in an unbroken line across the double photograph, and were of the same breadth throughout their extent.

The conclusion seems to be a strong one, that the electrical oscillations do not carry the atoms of metals with them in spark discharges. The atom is merely shaken up, and caused to emit the vibrations or subsidiary ripples which appeal to our senses as light and heat, while the electrical waves pass on without conveying the atoms.



NEW ELECTROPLATING DYNAMO.

A New Dynamo.

We illustrate a dynamo recently produced by Cutter & Wood, manufacturers of grinding, polishing and electroplating machinery, Boston, Mass., for electro-depositing metals, and for which the manufacturers claim a uniform full current of the requisite intensity for the purpose intended. As the electrolysis of some metals requires a stronger current than for others, the manufacturers take great pains to furnish a machine constructed to suit the specific purpose for which ordered. Their regular machines are wound for nickel-plating, this metal being the most universally used. Further particulars may be had of the manufacturers, at their address, 35 Arch street, where persons interested in electroplating should pay a visit.

Chicago, Ill.—New Era Electric Storage and Power Company; capital $250,000. Incorporators, John E. Wiles, J. A. Sharp, J. B. Hogue.

Hammond, Ind.—The Hammond, East Chicago and Whiting Street Railroad Company, with a capital stock of $100,000, has been incorporated. An electric storage battery, the invention of Theodore M. Foote, will supply the motive power. An ordinance has been obtained from the Hammond Town Council, and work will be begun in the Spring. The road will begin at the Illinois State line and run to Hammond, thence to Whiting street, passing through East Hammond. The incorporators are Frank Wells, Theodore M. Foote and Charles Thurtoon, all of Chicago.

Lancaster, O.—Lancaster Electric Company; capital, $15,000.

Chicago, Ill.—United States Electric Car Company; capital, $3,000,000.

Bellefontaine, O.—Bellefontaine Electric Light Company; capital, $25,000.

Jacksonville, Fla.—Jacksonville Electric Railway Company; capital, $100,000.

Chicago, Ill.—Adjustable Incandescent Light Joint Manufacturing Company; capital, $50,000.

Covington, Ky.—Keystone Light and Heat Company; capital $1,000,000. Incorporators, A. J. English and Powell Crossley.

Jeannette, Penn.—The Penn Electric Light Company; capital stock, $1,000, and the Jeannette Electric Light Company; capital stock, $1,000.

Monticello, Ill.—Monticello Supply Company, to furnish electric light; capital, $15,000. Incorporators, W. E. Smith, Peter Huston, H. E. Huston.

Chicago, Ill.—The Stiger-Newhall Electric Light Company; capital, $200,000. Incorporators, Charles W. Stiger, Walter C. Newhall and Charles A. Buell.

Chicago, Ill.—Brotherhood of Electrical Mechanics, for the promotion of benevolence and social intercourse; trustees, James O'Brien, Harry Wallace, Sam Grimblot and others.

Warsaw, N. Y.—Warsaw Electric Light and Power Company, Limited; capital, $25,000. Incorporators, G. C. Otis, E. H. Morris, E. E. Rowe, M. G. Rowe and E. M. Bartlett.

Aurora, Mo.—Aurora Electric Light and Power Company; capital, $50,000. Incorporators, J. C. Van Riper, C. H. Greene, Jr., J. H. Hill, John Montgomery, Jr., and W. L. Porter.

Chicago, Ill.—The Chicago Gas and Electric Fixture Manufacturing Company; capital $50,000. Incorporators, Henry G. Willard, Larsen Filstrup, Edward Baggott and Thomas W. Wilmarth.

Honey Grove, Tex.—Honey Grove Electric Supply Company; capital, $25,000. Directors: John A. Pierce, T. U. Cole, D. E. Taylor, R. J. Thomas, T. J. Boswell, F. T. Hockady, George A. Dailey.

Chicago, Ill.—The Universal Power Company, Chicago, for manufacturing and selling motors, cars, etc.; capital, $1,000,000. Incorporators, Joseph W. Lithgow, Augustus W. Osgood and George B. Johnson.

Chicago, Ill.—Love Electric Traction Company, to purchase, own and deal in patents pertaining to electricity; capital, $10,000,000. Incorporators, John C. Love, Homer N. Hibbard and Albert G. Wheeler.

Lincoln, Neb.—The Lincoln and Lake Park Electric Railway Company; capital, $250,000. Incorporators, George E. Bigelow, J. H. McMurtry, K. K. Hayden, F. J. Bush, W. B. Comstock, G. A. Bush and D. L. Brace.

New York City.—The capital stock of the Spanish-American Light and Power Company, Consolidated, has been increased $1,000,000, to $4,000,000. The entire capital of $3,000,000 was issued for property necessary in the business; the debts are $980,879.

Elizabeth, N. J.—The New Jersey Company, to supply electricity for street railways and mining operations; capital, $100,000. The incorporators are, Frederick A. Sawyer, of Garden City, L. I.; Jacob B. Belheimer, of New York; W. H. Clark, Theodore F. Levengood and James F. Dane.

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Several well known electrical men have made wagers that Kemmler was the first and last man who will ever be executed by electricity.

Reports have reached us from Dubuque and Des Moines, Ia., and Milwaukee, Wis., stating that heavy snow storms had not as yet interfered with the operation of the overhead electric railroads in those places. There is no good reason why the trolley should not do its work the year round, if only there is brain power in the offices of the railroad company.

The military telegraph is destined, in all probability, to be of great use during the Indian outbreak in the West. It now looks as if the hostile red men would keep things boiling until the Spring. During the time between now and then, if small detachments of soldiers were deputed to weave a web of telegraph wires about the scene of trouble, it might be the means of preventing bloodshed and render impossible the repetition of any such calamity as the Custer massacre.

A novel form of current indicator is proposed by M. Leconte, a French electrician. His idea is to provide a coil with a sectional core composed of a large number of iron disks separated by some elastic material. When current flows through the coil the disks are polarized and attract one another, thus tending to shorten the core. The disks are held in parallelism by one or more non-magnetic rods threading them. The terminal disk is connected with a pointer. Among the materials employed for springs were watch spring steel, blotting paper, flannel, india-rubber, etc.

President Whitney of the West End Electric Railway Company, Boston, advocates the building of an elevated road to accommodate the heavy travel in the crowded downtown districts. It is highly probable that when this elevated road is built—and a charter for it has already been obtained—electric power in some form will be used.

A PHONOGRAPH-TELEPHONE.

A German inventor, Mr. Siesegang, has constructed an ingenious electric phonograph which is said to reproduce the inflections of the voice with wonderful fidelity. The record is made on a band of prepared paper, much in the same manner as in the Edison phonograph. The receiver consists of a telephone, one side of which is connected to a metallic point which is adjusted to rest on the indented line on the paper as the latter is unrolled for the reproduction. The other side of the telephone is joined to a metal contact piece which just touches the edge of the paper band. The two contact makers are joined by a short piece of platinum wire which rests perpendicularly on the pointed metal strip that engages with the phonographic record. This arrangement constitutes a microphone, and the vibrations imparted to the pointed strip by the marks on the paper as the band is drawn past, result in perfect reproduction of the voice in the telephone.

EUROPEAN SUBWAYS.

Subway matters in Europe seem to progress much in the same eventful manner as has been the case with the general introduction of underground wires in New York and other American cities. In London we hear of occasional manhole explosions, and still more serious eruptions of the public temper on account of extended excavations in busy thoroughfares. Paris, too, is afflicted in the same way. Trenches are cut and barricades erected in many of the main streets and boulevards, and a comic paper gives a cartoon showing the Paris map-sellers disposing of maps of the city with the streets "still passable" colored red. A great many of the mains now being laid in Paris for electric light and power purposes are of bare copper supported on porcelain insulators in an iron duct or channel, after the method introduced in England by R. E. Crompton & Company. Rubber insulated cables with suitable mechanical protection are also used, these being buried directly in the ground without iron pipes or other ducts.

A DELIGHTFUL ELECTRICAL GATHERING.

That the first of the series of dinners inaugurated at the New York Electric Club last Thursday night was a success, no one who was present or who reads the account of it in this issue of the ELECTRICAL REVIEW will deny. The dinner was inexpensive and at the same time one of the best ever served in the Club.

It is well that custom has set the fashion of first eating and then speaking; otherwise this good dinner would not have been eaten. The speeches were brilliant and bristling with interesting facts and scintillations of wit. The sensible, comprehensive and interesting address delivered in Mr. Wiman's entertaining style, the electrical outbursts of brilliancy and inimitable anecdotes of Joe Howard, Jr., and of Foster Coates, the graceful periods of Mr. Martin, the business-like observations of Mr. Alexander, the ever timely remarks of President Madden, and the charming music of Mr. Maguire, furnished a feast of mentality such as is seldom offered outside of the old New York clubs famous for such things.

It is a noteworthy and encouraging fact that every speaker agreed that the Electric Club had done much good on the lines chosen for its work, and that it has illimitable, and, as yet, untried possibilities for the working of good influences in the future.

THE PATH OF THE EXPLORER.

The civilized world has heard a great deal lately about the exploration of darkest Africa, and newspapers the world over have teemed and keep on teeming with information relating to African travels and African travelers, divisions of territory and foundations of settlements, embroilments and bombardments, from all of which it may be gathered that the civilization of the vast country which has so long remained practically unknown to the rest of mankind is going on apace. This energetic movement has sprung up of late years only, during the age of steam and electricity. It is true that there have been African explorers for centuries back, but they accomplished little of practical and lasting value beyond acquiring information regarding the country, often of a vague and uncertain nature, and transmitting to future generations for the guidance of a new race of explorers. It is these, the explorers of our day, who have achieved results of a lasting and beneficial order; who have opened up the country to trade and commerce, who have navigated and surveyed the rivers and lakes, who have made treaties with the native tribes and prepared the way for the railroad and the telegraph. What an interesting parallel can be drawn between the civilization of Africa and the practical application of electricity. The two explorations are practically contemporaneous. How much more rapid has been the progress and how much more marvellous the results achieved in the exploration of electricity than has been the case with the exploration of Africa! Yet how much yet remains to be discovered, both in the science and in the continent!

In electricity we have had our early discoverers and explorers, such as Gilbert, Volta, Galvani, Oersted, Ohm, Faraday, Henry, Morse, Cooke, Wheatstone, and a host of others, whose names are immortalized in the technical language of the art. Some have been accidental discoveries, lighting upon strange novelties in their journeyings along the by-paths of science. Others have been patient and painstaking explorers and investigators, opening up vast rivers of information, surmounting mountainous difficulties, and traversing dark, mysterious forests and valleys, thus bequeathing to their successors of the present day precious stores of valuable information to guide them in the practical commercial occupation of the country. Truly, electricity has had its Mungo Parks, Livingstones and Stanleys.

To-day the development of electricity has shot far ahead of Africa, but like the dark continent it yet has secret treasures in store for the investigator who shall strike out in new directions or unearth what lies hidden beneath the surface and passed over by the too hasty explorer bent on accomplishing one object, and one only. There are also many by-ways and neglected tracts that will repay careful research; from these the richest rewards are often reaped.

Africa's rivers and lakes, pasture lands and mines, are being made known to the world by the great explorers of to-day, Stanley, De Brazza, Peters and other lesser lights. What African river or lake or tract of land, however, can compare in importance to the invention of the telegraph, the electric light or the telephone? As explorers in the realms of the unknown, are not Edison, Brush, Thomson and Bell, worthy of as great and enduring fame as Stanley or De Brazza?

In the partition of the new Africa the nations of Europe have stretched forth greedy hands, grasping all that they could hold, and sometimes a little more. In the modern exploration of electricity and in its practical application to the advance of civilization, America has taken the lead and deservedly won the laurels which are on all hands willingly conceded. Electricity has done much for America, and America has done much for electricity. If other nations have a monopoly of African exploration and the good that results thereby, America certainly has contributed most largely to the development of the mysterious resources of electricity, and, to-day, she undoubtedly enjoys the lion's share of the benefits that have followed from the activity of her scientific explorers and inventors.

CORRESPONDENCE.

OUR BOSTON LETTER.

Mr. John W. Lyon, a well known manufacturer, of Providence, R. I., was a guest of the Boston Electric Club one night this week.

Mr. C. R. Fish, general manager Woburn, Mass., Electric Light Company reports business brisk and satisfactory at his station. The demand for additional arc and incandescent lights, as well as for electric power, has been steadily on the increase since November 1, and new orders are daily entered on the company's books.

Mr. C. E. Bibber, the genial traveling salesman of the Holtzer-Cabot Electric Company, this city, returned home a few days ago after a long business trip. Mr. Bibber visited most of the principal cities and towns in the Southern and Western States.

Mr. Thomas T. Robinson, for many years past identified with Thomson-Houston Electric Company's interests, has accepted the appointment as general manager of the Hyde Park, Mass., Electric Light Company.

Mr. Charles F. Pollock, the affable and wide-awake secretary of the Electric Mutual Insurance Company, is enjoying a fortnight's vacation in the hunting fields of northern Maine.

Boston Electric Club.—The annual meeting of this club will be held at its rooms on the evening of Thursday, December 11, at 8 o'clock. Very important business will be transacted at this meeting, including the election of officers for 1891.

Messrs. Claflin & Kimball, New England agents for the Mather Electric Company and Perkins' Electric Lamp Company, have removed from No. 105 Summer street to large and comfortable quarters in the Shoe and Leather Association Building, on Bedford and Kingston streets, this city.

Intermediate Speed Regulator which was illustrated and described on page 184 in the ELECTRICAL REVIEW of December 6, has already attracted considerable attention and favorable criticism among the electric light people of this section. This meritorious device is manufactured by the T. M. Foote Regulator Company, No. 269 Franklin street, this city.

East Bridgewater, Mass.—Recent advices from the above named town state that "a manufacturer of electrical appliances has applied for a long lease of the factory buildings formerly occupied by the Brayton Petroleum Engine Company."

Thomaston, Me.—An electric street railway is being projected between the above-named town and Camden, Me. It is reported that the projectors of this enterprise are the capitalists who built the electric road from Augusta to Hallowell, Me.

Northbridge, Mass.—Articles of incorporation have been granted to the Whitinsville Street Railway Company to conduct an electric street railway at Northbridge, Mass., and to extend to Whitins' Station, a distance of 1½ miles.

The Standard Electric Time Company, of New Haven, Conn., has justly earned an enviable and widespread reputation for the reliable and serviceable electric time system it has introduced in a large number of cities and towns. The company has been successful also in the installation of its time system in factories, hotels, club houses and large mercantile establishments. Mr. W. D. Warner, of Ansonia, is the inventor of this time system.

The Boston Electric Light Company has been an active and successful corporation from the day it introduced its first electric light in this city; yet, to-day, the company is passing through the most trying period of its experience, as its present facilities, although enormous, are insufficient to meet the demand for arc and incandescent electric lights and electric power. Less than two months ago the company increased the lighting capacity of its stations on Ferdinand and Summer streets by adding three 650 light incandescent machines, and also several large arc light dynamos; and now preparations are being made at both stations for an additional increase of electric light and power machines.

Manchester, N. H.—Advices from the above-named city, under date of December 2d, state: A company is to develop the water-power at Kelley's Falls on the Piscataquog River, for the purpose of operating a new electric light plant, to be devoted wholly to incandescent lighting. A 12-foot dam has been built, and two large Rodney-Hunt turbine wheels have been put in, leaving room for two more. An effort will be made to bring new industries to the section to be supplied with electric power. Wires will be strung to this city.

Pittsfield, Mass.—It is reported that a new electrical enterprise will soon be inaugurated in the above-named city, which is to be incorporated under the name of the Stanley Electric Manufacturing Company. The company's interests will be managed by Mr. William Stanley, Jr.

Crosby Steam Gage and Valve Company, of this city, has favored me with a copy of its new catalogue. It is a handsome book, and is profusely illustrated with artistic engravings of the useful products manufactured by the enterprising and successful company named above. Among the many specialties set forth in the catalogue (136 pages), the Crosby steam engine indicator has several pages of interesting matter (illustrated) devoted to a comprehensive description of its general construction. Many of our readers are familiar with the merits possessed by the Crosby indicator and will recall to mind that it received the highest award—a gold medal—at the Paris Exposition of 1889. This indicator is now in use in nearly every electric light station in the United States and Canada; and it is being extensively adopted abroad wherever its peculiar methods have become known.

The Holtzer-Cabot Electric Company, of this city, is entitled to congratulation on the remarkable success of its Volunteer safety burner, better known to the trade as the "Volunteer Pendant." It is undoubtedly one of the most reliable and durable electric gas-lighters on the market, and is rapidly ingratiating itself in public favor, as is evinced by its enormous sale during the past three months. One order alone from a Western customer received last week called for five thousand "Volunteer Pendant" burners.

The Russell Electric Company, of this city, has absorbed the Russell Electric Lamp Company and the former, with virtually the same officers and capital ($300,000), succeeds to all the patents, franchises, contracts, etc., etc., owned by the latter. The company has just completed the first lot of its new style arc lamp, solely intended for interior use, being specially suited for corridors or rotundas of large halls, hotels, theatres, clubs, etc., etc. This new lamp is 20 inches in length and the globe about nine inches from top to base. Lamp is about one-third the size the Russell Company's Standard lamp. It is guaranteed to burn eight hours or longer on either a six or eight ampere current. The "B. & S." Electric Equipment Company, New York city, has been appointed agents for the Russell Electric Company for States of New York, New Jersey and Pennsylvania. W. I. B.

BOSTON, Dec. 6.

OUR CHICAGO LETTER.

A License was granted by the Secretary of the State to the Bear Magneto Electric Company, of Chicago, to do a manufacturing and general light, heat and power business. The concern is capitalized for $3,000,000, and has among its incorporators S. J. M. Bear, ex-city engineer, Norway, and Franklyn Babcock. Great claims are made by the inventor, Mr. Bear, for a new type of dynamo which the company will place on the market. The new machine has a double revolving armature.

The Trouble between the City Council of Burlington, Iowa, and eastern capitalists who hold a franchise for an electric street railway in this city has been adjusted in a satisfactory manner and work will begin at once on the construction of the road.

Chicago, December 6. D. B. D.

PERSONAL.

Mr. T. Jefferson Coolidge, Jr., of Boston, has entered the Thomson-Houston directory.

Inventor F. W. Royce, of Washington, D. C., came over to the metropolis last week to look after the collection of some Irish dividends, and received a cordial welcome from his many friends hereabouts.

Mr. Stephen D. Field has just returned from an eight weeks' visit to his old stamping ground, California. "I was pleased to find," says Mr. Field, "that all the electrical work I did 11 years ago in San Francisco has withstood the test of time and is still in service. The annunciator plant in the Grand Hotel, San Francisco, was the second installation of the kind in America. I put it in in 1868, and it is still in daily use."

Mr. H. J. W. Dam, a former New Yorker, was an enthusiastic student of electricity and member of the Electric Club. For the past two years or more he has been a resident of London, and in a recent issue of the New York *Sun* he is mentioned as follows:

The story connecting Henry J. W. Dam, the American journalist in London, with the "Jack the Ripper" scare is the veriest bosh. Dam is a gifted writer, and, though usually an indolent man, is indefatigable when his interest in any subject is aroused. It was so aroused during the Whitechapel stir, and Dam almost lived in the slums while endeavoring to catch the murderer. More than any other man he stirred the police to unprecedented energy and watchfulness, and as a result of his studies he wrote many notable descriptive sketches of the region and people of Whitechapel. His work was all honest and legitimate from beginning to end.

Telephonic Fire Alarms.

George C. Hale and Albert Barrett, of Kansas City, Mo., have patented a combined telephone and fire alarm system. Provisions are made for turning in a signal by audible or visual indications and for establishing telephonic communication between fire headquarters and outlying stations and maintaining it free from interruption until the communication is understood. When a fire signal is being transmitted the telephonic apparatus is automatically cut out. When the signal is completed and recorded, telephonic communication is again possible and oral particulars respecting the fire may be given.

Traveling Contact for Electric Railways.

In the accompanying engraving is illustrated an improvement in traveling contacts, invented by Arthur W. Adams, of Kansas City, Mo. The invention is designed to provide a greater surface of contact than is afforded by the trolley wheel ordinarily employed to connect the car motor into circuit with an overhead wire, and at the same time retain the advantages offered by such wheels of offering but little frictional resistance and

creating but little wear on the conductor. The invention will be understood on inspection of the drawing, H representing the arm supported upon the top of the car, and C a belt formed of metallic links concaved so as to embrace the conductor, as shown in Fig. 3, and spanning two light wheels, A A^1. Instead of a belt formed of links, two spiral springs run over double-grooved pulleys, as illustrated in Fig. 2, may be used, these springs acting as belts and rolling upon the surface of the conductor. A superficial electric contact, extending throughout the entire length of the belt, is made with the overhead conductor, resulting in a large reduction of the resistance between the conductor and the collector.

Big Electric Business.

The central station lighting department of the Chicago office of the Thomson-Houston Electric Company sold during the month of November apparatus for 7,200 incandescent lights and 290 arc lights. The apparatus shipped from that office during November was for 1,074 arc lights, 24,175 incandescent lights and 41 horse-power in electric motors.

St. Louis Water Power Company.

The official announcement has been made of the transfer of the entire stock of the St. Louis Water Power Company, which owns the great water power of the St. Louis River, above Duluth, to a syndicate composed of Duluth, Eastern and English capitalists. The purchase price is $1,000,000, and the new company will spend another million in building dams and otherwise improving the power so it can be utilized. The chief owner of the old company was Jay Cooke, and associated with him were several Philadelphia and some Western men.

The purchasers are E. L. Emery, J. H. Triggs, F. E. Kennedy, J. A. Taylor and Dr. J. A. Smealie, of Duluth; F. J. Stevens, Boston; Sumner and Albert Wallace, Rochester, N. Y.; George W. Lane, Salem, Mass., and Reginald Bolton, London, England, the latter representing other English capitalists. The new company acquires several thousand acres of land which lie on both sides of the river, and extend along the Dalles of the St. Louis, from Fond du Lac to above Thompson, eight miles in all.

One of the plans of the company is to supply electric power to Duluth, Superior and all the manufacturing suburbs of those places.

A Model English Electric Light Installation.

The famous exhibition of waxwork known as Madame Tussaud's, London, is now handsomely illuminated by electric light. The installation was designed by Mr. Gisbert Kapp. The plant consists of two 16 horse-power Otto gas engines driving 20 kilowatt shunt wound continuous current dynamos, running at 650 revolutions per minute, at a voltage of 110 to 140 volts. There are two main storage batteries of 112 cells, the joint capacity of which is 1,000 ampere hours, and a small supplementary battery of 240 ampere hours. Great care has been taken to prevent vibration of the building; a bed of concrete 18 inches thick was first laid, upon which was placed a layer of cocoa-nut fiber ⅝ inch thick reduced by pressure of the superincumbent mass to ⅛ inch. Upon this, as a preventive of entrance of moisture, was laid a layer of sheet lead in one unbroken surface. Upon the lead was placed nine inches of brickwork, laid loose without mortar. Upon the brick layer was laid the concrete foundation forming the floor of the engine-room, into which was cemented the bolts for the machinery. These provisions are said to have resulted in perfect immunity from vibration in the building. Every room is served with three distinct circuits, alternate lamps being connected in different circuits, and a distinct group of lamps being supplied by a "panic" battery. No soldered joints were permitted. Every lamp or group has an unbroken wire running direct from the ceiling rose to the fuse box. Each of the three circuits has an independent fuse-box on each floor. There are no switches except in the engine-room. The switchboard is placed in a compartment by itself in the engine-room. The two main circuits are known as the "blue" and the "black" circuits. There are 20 switches, 10 to the blue and 10 to the black. The third, or "red," circuit—the panic circuit—is controlled by its own switch, and is so arranged that the small set of accumulators can be thrown upon the lamp circuit or the dynamo when charging—one or the other, but not together. The panic circuit is kept ordinarily always on all through the night. There are about 300 incandescent lamps in all, besides four arc lamps—one of the latter being 4,000 candle-power. The wires have all been calculated for a current density of 500 amperes per square inch section only, and are of the highest class Silvertown insulation. The insulation tests have been carefully made, and also each separately calculated upon the basis of number of lamps, according to the Phœnix rules. The tests have been made by Goolden's ohm-meter and have proved extremely satisfactory, in most cases being half as much again and in some cases double as much as the rules require—averaging from 370,000 to 1,000,000 ohms insulation resistance.

BOOK NOTICES.

"Journal of the American Chemical Society" for October has been received.

"The Thirty-first Annual Report of the Trustees of the Cooper Union for the Advancement of Science and Art" has been received.

"The Teaching and History of Mathematics in the United States," by Florian Cajori, M. S., has been received. It is one of the publications of the government bureau of education, and is rich in statistics on the subject of which it treats.

"Handy Lists of Technical Literature, Part IIa. Electricity and Magnetism," has been received from the compiler, H. E. Haferkorn, Milwaukee. This is the first attempt to catalogue electrical literature published between 1880 and October, 1890, in a practical and convenient form. To the student and to any one accustomed to go into researches in any special branch of electrical work this is an invaluable aid. Our only unfavorable criticism is that the list of electrical weeklies and monthlies might have been made a little more complete and exact.

"A Treatise on Electro-Metallurgy, by W. G. MacMillan," has been received from the J. B. Lippincott Company. This is one of the new books of the season, and has the advantage of having been written by a practical chemist and metallurgist. The treatment of the subject is technological rather than technical, and unnecessary descriptive detail is omitted. Some very valuable tables are included in the work. The book should immediately take rank as among the best of the many works on the subject.

Telephonic News

⁂ The telephonic administration in Sweden is buying up outside companies.

⁂ The Berlin Telephone Company has 14,000 subscribers, while all France has only 12,800.

⁂ A telephone exchange was opened at Dijon, France, on November 1st, starting with 99 subscribers.

⁂ Durham and Raleigh, N. C., are to be connected by telephone. The line will be in operation within ninety days.

⁂ W. H. Wright, of Providence, R. I., last week succeeded Henry L. Bull as manager of the Newport office of the Providence Telephone Company.

⁂ As '93 approaches rumors about telephone schemes grow numerous. Our advice to prospective new telephone companies is to look before they leap.

⁂ The Mayor and City Council, of Baltimore, Md., have entered suit in the city court against the Chesapeake and Potomac Telephone Company, claiming $10,000 damages for non-payment of taxes on 100 shares of the capital stock of the corporation for the years 1886, 1887, 1888 and 1889.

⁂ The New York & Pennsylvania Telegraph & Telephone Company has a construction force at work extending its long distance line to Warren, Pa., which will be within earshot of Boston and Chicago within a short time. Bradford and Olean will be connected with the line early next spring.

⁂ The National Telephone Company, Limited, of England, announce that the trunk line between the London, Manchester, Liverpool and Birmingham exchanges is now open to the public. The charge for three minutes' conversation is 3*s.* to Manchester and Liverpool, and 1*s.* 6*d.* to Birmingham.

⁂ Mr. Charles Wilson, superintendent of the Chicago Telephone Company, has been promoted to the position of general superintendent. Mr. Wilson is one of the practical men in the service, having invented many valuable improvements, and will be congratulated on all sides for his deserved promotion.

⁂ The New England Telephone Company has finished the rebuilding of its line to Chesterfield, Vt., the new route being some three miles shorter than the old. The poles are of sufficient strength to carry the new metallic long-distance line which is to connect Bellows Falls, Brattleboro and Keene with Boston. Work has now been begun on the reconstruction of the Wilmington line.

⁂ The Albany, N. Y., common council last week received a communication from vice-president A. B. Uline, of the Hudson River Telephone Company, in which it is stated that the company intends to erect a fire-proof building to be used as a telephone exchange in Albany. Permission was asked of the aldermen to put the wires in underground conduits. Negotiations are in progress for the purchase of a site for the building.

⁂ The following towns are now telephonically connected with Paris: Lille, Rouen, Havre, Elbeuf, Rheims, Lyons and Marseilles, and, in addition, one foreign city, viz., Brussels. It is also proposed to connect with the capital, Amiens-Arras, Lille, St. Quentin, Orleans and Troyes, while a new network is projected with Epinal as its center. There are about 8,000 subscribers in Paris, 1,800 having joined during the current year. In the province there are only about 6,000 subscribers. After the completion of lines in hand, there will be 22 distributing systems in the neighborhood of Paris, 50 local systems (including two in Algeria), 20 connections with other towns, and 12 installations for long distances from Paris. The telephone connection with London is expected to be completed early next month.

A Question in Metallurgy.

The following reply is supplied by *The Mechanical News* to an enquiry as to whether one metal can be changed into another: A metal may be replaced by another metal; a fact which might be illustrated in a mechanical way by taking a wooden beam out of a building and putting one of another kind in its place. That would not be turning one kind of wood into another by any means. It is even possible to replace a metal in a compound by other substances. But that proves nothing. We may put a piece of cast-iron into the ordinary pickling solution of the foundries, and, after a long time, upon taking it out we shall find that to all appearances it has turned into a kind of hard plumbago or graphite. It is certainly no longer iron, since it does not possess the weight, nor color, nor body of the iron. Indeed it has lost nearly all its metallic properties. By closer investigation it is found that nearly all of the metallic iron has been dissolved and the graphite remains behind, holding the shape of the casting perfectly. It is a pretty little piece of hocus pocus, but it does not prove anything. If all the pickle used was to be saved, it would be found that it contained the iron which the casting had lost, and its weight added to that of the graphite would equal that of the original casting.

When iron is put into a copper solution, containing, say, sulphate of copper, the acid deposits the copper and dissolves iron. This accounts for the instant blush of copper on a knife blade when it is put into a bath of sulphate of copper. A thin film of iron is taken away, and a film of copper left in its place. This accounts for a part of the facts without any necessity for supposing that there is any transmission of one metal into another. If this process of dissolving iron and throwing down copper in its place be continued for a long time, there is nothing to prevent a complete replacement of one metal by the other. Reasoning from the action of the pickling liquid, we should suppose that the copper would not prove upon assay to be perfectly pure. It would probably seem so. The inference would be that the iron would leave its carbon behind to be mingled with the copper, and that the deposited copper would be sufficiently porous to permit the solution to reach the enclosed iron. It must be understood that in both the cases mentioned the action begins at the surface and slowly extends toward the center.

Buy why should not our correspondent try the experiment for himself? A pound of sulphate of copper dissolved in water is not costly, and a small piece of steel, like a knife blade, could be suspended in it. As the solution changed from blue to green, it would mark the replacement of the copper by the iron. But if the relative quantity of solution be large, this change would not be noticed. Should it take place, more copper crystals would have to be added, or a new solution made so as to keep up the action.

As to the hardening, that is another question, in regard to which it is safe to say that it is not a lost art. It is said that the ancients knew how to harden copper so that they could cut stones with it, and use it as we do steel. Well, they did cut stones with copper, and they cut glass with it, and so do we to day. But it is not done by hardening the copper. Emery and a copper tube are a first class means for boring glass. A copper lap will slit an iridosmium point on a gold pen as neatly as a knife a piece of cheese. But it is not because the copper is hard. The vases and many other stone objects made by the ancient Egyptians proved that they used this method of working. But among the thousands of tools used by them which have been found, none of the hard copper has come to light. Even the easily perishable steel and iron tools have come down to us, but not the hard copper. These are some of the reasons why we do not believe in it very much. What we want is to see and test some of it. Let those who are so certain bring out a good hard drill or an axe made of it. Let us have a chance to test it. Until a sample of the tempered copper is produced, it is safe to reserve a decision. The known facts are rather against it, and it is fairly certain that the ancients knew nothing of it. When the modern man can bring on the tempered copper that will hold an edge something like steel, everybody will be glad to know about it, and there will be no small amount of money made out of the invention.

The German Postmaster-General, Herr Stephan, issued a general order for facilitating the rapid despatch by telegraph of the speech from the throne, delivered recently at the opening of the Prussian Diet. The number of telegraph clerks at the chief office was doubled on that occasion.

Fallacies about Electro-Magnets.

ABSTRACT OF A CANTOR LECTURE BY PROF. SILVANUS P. THOMPSON.

In spite of Joule and of the laws of traction, showing that the pull is proportional to the area, you have this anomaly—that if you take a bar magnet having flat-ended poles, and measure the pull which its pole can exert on a perfectly flat armature, and then deliberately spoil the truth of the contact surface, rounding it off, so making the surface gently convex, the convex pole, which only touches at a portion of its area instead of over the whole, will be found to exert a bigger pull than the perfectly flat one. It has been shown by various experimenters, particularly by Nicklès, that if you want to increase the pull of a magnet with armatures, you may reduce the polar surface. Old steel magnets were frequently purposely made with a rounded contact surface. There are plenty of examples. Suppose you take a straight round core, or one leg of a horseshoe, which answers equally, and take a flat-ended rod of iron of same diameter as an armature; stick it on endwise, and measure the pull when a given amount of ampere turns of current is circulating round. Then, having measured the pull, remove it and file it a little, so as to reduce it at the edges, or take a slightly narrower piece of iron, so that it will actually be exerting its power over a smaller area, you will get a greater pull. What is the explanation of this extraordinary fact?

Take an electro-magnet and round off one pole leaving the other flat, then place a flat armature across the poles. Which end of the armature will be detached first?

If you were going simply by the square inches, you would say this square end will stick on tighter; it has more gripping surface. But, as a matter of fact, the other sticks tighter. Why? We are dealing here with a magnetic circuit. There is a certain total magnetic reluctance all round it, and the whole number of magnetic lines generated in the circuit depends on two things—on the magnetising force, and on the reluctance all round; and, saving a little leakage, it is the same number of magnetic lines which pass through both legs of the magnet, but owing to the fact that there is a better magnetic contact at the rounded pole, the number of lines per square inch runs up higher at that point.

Let me show you yet another experiment. This is the same electro-magnet which has one flat pole and one rounded pole. Here is an armature, also bent, having one flat and one rounded pole. If I put flat to flat and round to round and pull at the middle, the flat to flat detaches first; but if we take round to flat and flat to round, we shall probably find they are about equally good—it is hard to say which holds the stronger.

I now pass to the consideration of the attraction of a magnet on a piece of iron at a distance. And here I come to a very delicate and complicated question. What is the law of force of a magnet, or electro-magnet, acting at a point some distance away from it? I have a very great controversy to wage against the common way of regarding this. The usual thing that is proper to say is, that it all depends on the law of inverse squares. Now, the law of inverse squares is one of those detestable things needing to be abolished, which, although it may be true in abstract mathematics, is absolutely inapplicable with respect to electro-magnets. What is the law of inverse squares? We had better understand what it is before we condemn it. It is a statement to the following effect: That the action of the magnet (or of the pole, some people say), at a point at a distance away from it, varies inversely as the square of the distance from the pole. There is a certain action at one inch away. Double the distance, the square of that will be four, and inversely the action will be $\frac{1}{4}$; at double the distance the action is $\frac{1}{4}$; at three times the distance the action is $\frac{1}{9}$, and so on. You just try it with any electro-magnet; nay, take any magnet you like, and unless you hit upon the particular case, I believe you will find it to be universally untrue. Experiment does not prove it. Coulomb, who was supposed to establish the law of inverse squares by means of the torsion balance, was working with long thin needles of specially hard steel, carefully magnetized so that the only leakage of magnetism from the magnet might be as nearly as possible leakage in radiating tufts at the very ends. He practically had point poles. When the only surface magnetism is at the end faces, the magnetic lines leak out like rays from a center, in radial lines. Now the law of inverse squares is never true except for the action of points; it is a point law. If you could get an electro-magnet, or a magnet with poles so small in proportion to its length that you can consider the end face of it as the only place through which magnetic lines leak up into the air, and the ends themselves so small as to be relatively mere points; if, also, you can regard those end faces as something so far away from whatever they are going to act upon that the distance between them shall be large compared with their size, and the end itself so small as to be a point, then, and then only, is the law of inverse squares true. It is a law of the action of points. What do we find with electro-magnets? We are dealing with pieces of iron which are not infinitely long with respect to their cross-section, and generally possessing round or square end faces of definite magnitude, which are quite close to the armature, and which are not so infinitely far away that you can consider the polar face a point as compared with its distance away from the object upon which it is to act. Moreover, with real electro-magnets there is always lateral leakage. The magnetic lines do not all emerge from the iron through the end face. Therefore, the law of inverse squares is not applicable to that case. What do we mean by a pole, in the first place? We must settle that before we can even begin to apply any law of inverse squares. When leakage occurs all over a great region, as shown in this diagram, every portion of the region is polar. The word polar simply means that you have a place somewhere on the surface of the magnet where filings will stick on, and if filings will stick on to a considerable way down toward the middle, all that region must be considered polar, though more strongly at some parts than at others. There are some cases where you can say that the polar distribution is such that the magnetism leaking through the surface acts as if there were a magnetic center of gravity a little way down, not actually at the end; but cases where you can say there is such a distribution as to have a magnetic center of gravity are strictly few.

The pull of the electro-magnet on its armature is not proportional to the distance, nor to the square of the distance, nor to the cube, nor to the fourth power, nor to the square root, nor to the three-halfth root, nor to any other power of the distance whatever, direct or inverse, because you find, as a matter of fact, that as the distance alters something else alters too. If your poles were always of the same strength, if they did not act on one another, if they were not affected by the distance in between, then some such law might be stated. If we could always say, as we used to say in the old language, "at that pole," or "at that point," there are to be considered so many "units of magnetism," and at that other place so many units, and those are going to act on one another; then you could, if you wished, calculate the force by the law of inverse squares. But that does not correspond to anything in fact, because the poles are not points, and, further, the quantity of magnetism on them is not a fixed quantity. As soon as the iron armature is brought near the pole of the electro-magnet there is a mutual interaction; more magnetic lines flow out from the pole than before, because it is easier for magnetic lines to flow through iron than through air.

Here is a paradoxical experiment. I have here a bar electro-magnet, which we will connect to the wires that bring the exciting current. In front of it, and at a distance from one end of the iron core, is a small compass needle with a feather attached to it as a visible indicator, so that when we turn on the current the electro-magnet will act on the needle, and you will see the feather turn round. It is acting there at a certain distance. The magnetizing force is mainly spent not to drive magnetism round a circuit of iron, but to force it through the air, flowing from one end of the iron core out into the air, passing by the compass needle, and streaming round again, invisible, into the other end of the iron core. It ought to increase the flow if we can, in any way, aid the magnetic lines to flow through the air. How can I aid this flow? By putting on something at the other end to help the magnetic lines to get back home. Here is a flat piece of iron. Putting it on here at the hinder end of the core ought to help the flow of magnetic lines, you see that the feather makes a rather larger excursion. Taking away the piece of iron diminishes the effect. So, also, in experiments on tractive power, it can be proved that the adding of a mass of iron at the far end of a straight electro-magnet greatly increases the pulling power at the end that you are working with; while, on the other hand, putting the same piece of iron on the front end as a pole-piece greatly diminishes the pull. Here, clamped to the table, is a bar electro-magnet excited by the current; and here is a small piece of iron attached to a spring balance, by means of which I can measure the pull required to detach it. With the current which I am employing the pull is about two and a half pounds. I now place upon the front end of the core this block of wrought iron: it is itself strongly held on; but the pull which it itself exerts on the small piece of iron is small. Less than half a pound suffices to detach it. I now remove the iron block from the front end of the core, and place it upon the hinder end. And now I find that the force required to detach the small piece of iron from the front end is about three and a half pounds, instead of two and a half pounds. The front end exerts a

bigger pull when there is a mass of iron attached to the hinder end. Why? The whole iron core, including its front end, becomes more highly magnetized, because there is now a better way for the magnetic lines to emerge at the other end and come round to this. In short, we have diminished the magnetic reluctance of the air part of the magnetic circuit, and the flow of magnetic lines in the whole magnetic circuit is thereby improved. So it was also when the mass of iron was placed across the front end of the core; but the magnetic lines streamed away backwards from its edges; and few were left in front to act upon the small bit of iron. So the law of magnetic circuit action explains this anomalous behavior. Facts like these have been well known for a long time to those who have studied electro-magnets. In Sturgeon's book there is a remark that bar magnets pull better if they are armed with a mass of iron at the distant end, though Sturgeon did not see what we now know to be the explanation of it. The device of fastening a mass of iron to one end of an electro-magnet in order to increase the magnetic power of the other end was patented by Siemens in 1862.

Crosby Batteries Win an Award.

The very complete and interesting exhibit of Crosby batteries at the American Institute Fair, recently described in the ELECTRICAL REVIEW, has secured the highest award from that organization for all the batteries manufactured by the Crosby Electric Company.

The Crosby Electric Company have recently succeeded in purchasing the business of the Federal Electric Company, heretofore carried on at 10 Cedar street, New York, together with their stock and the patents under which their goods are manufactured. This is another advance in the expansion of the business of the Crosby Electric Company. Their handsome building at 87 and 89 South Fifth avenue presents a bustling scene of activity at all times.

Rule for Electric Bell Fitting.

TO THE EDITOR OF ELECTRICAL REVIEW:

In the fitting of electric bells, signals, indicators, fire and burglar alarms, gas lighting apparatus, etc., and more especially in repairs, renewals or additions thereto, it is of great importance to be able to distinguish "battery wires," *i. e.*, wires leading direct from or to the battery, from "connecting wires," *i. e.*, wires running between pushes and indicators, indicators and bells, alarms and bells, etc.

I have devised a rule (see p. 56, "Practical Electrical Notes," 2d Ed., Spow) the adoption of which enables "connecting wires" to be distinguished at a glance from "battery wires," and, what is more, "+battery wires" and "— battery wires" are clearly indicated.

My rule is as follows:

"All wires leading from the + pole of the battery to any push, etc., should be of a plain bright color (say white, yellow or red); all wires running between apparatus—'connecting wires'—should have a covering in which two or more colors are blended; and all wires leading direct back to the battery should be of a plain dark color—preferably black."

The adoption of this rule by electric bell fitters would, I beg to suggest, save much valuable time which is now wasted in what is generally termed "testing."—Yours faithfully, W. PERREN MAYCOCK,
A. M. Inst. E. E.

Croydon, England, Nov. 16, 1890.

This is not a new idea here in America, although it may be in England. The majority of American electric bell-hangers furnish their wiremen with a little card on which are printed in colors small lengths of the various wires used. One will be marked "battery," another "connections," others "gas lighting," "annunciator," etc. While absolute conventions in regard to this kind of wiring have not been universally adopted, the practice is rather uniform and is becoming more so every day. Some bell-hangers object to telling "outsiders" about their wiring and the kinds of wire used.

.... A deed was recorded in Washington, D. C., on November 28th, by which W. N. Armstrong, of New York, as referee, conveyed, for a consideration of $390,000, to John W. Mackey, of Virginia City, Nev., all the rights, franchises and privileges of the Bankers' and Merchants' Telegraph Company, the Banker's and Merchants' Telegraph Company, of New Jersey; the Bankers' and Merchants' Telegraph Company, of Pennsylvania, and the Bankers' and Merchants' Telegraph Company, of Indiana, including the lines of the company from Washington to New York.

Hindrances to Scientific Progress.

In Professor Mendenhall's opinion the relations between the scientific few and the non-scientific many in this country are not as satisfactory as they ought to be. He finds that, though individuals here and there are disposed to be very liberal in the endowing of scientific schools and colleges, and though science is professedly held in very high honor, the community at large hardly seems to know how to distinguish between a true man of science and a *dilettante* or charlatan. In many cases the latter more easily secures attention and credence than the best qualified scientific specialist. He finds, too, that scientific methods of thought are not permeating the community to the extent that might be expected, considering all that is said in praise of science and the extensive provision that is already made for imparting a knowledge of its principles. What are the obstacles that stand in the way of more favorable results? The main fault all through, however its phases may vary, is that men of science, or many of them at least, are not sufficiently practical in their views and aims. They allow a great gulf to form between themselves and the non-scientific world, and regard the phenomenon with indifference, or even with complacency. They have an infinite contempt for any science that aims at being popular; and we are not sure that the efforts we have ourselves made to interest the public in scientific subjects have not encountered in certain quarters a high disdain. Professor Mendenhall, who may be trusted to know whereof he speaks, asserts that some men in their scientific disquisitions are "guilty of the crime of unnecessary and often premeditated and deliberately planned mystification." Think of it for a moment—a man of science aiming not at being as lucid as possible, at bringing his ideas within the comprehension of as large a number of persons as possible, but contrariwise trying to achieve the maximum of obscurity and the maximum of intellectual exclusiveness! The thought is really a painful one; and yet we may profitably dwell upon it, for it shows that scientific knowledge, like any other form of power, needs to be humanized if it is not to degenerate into a selfish and pretentious tyranny. One thing which must always be set to the credit of the founder of the positive philosophy is that he clearly saw the risk which pure science ran of losing itself in all kinds of refinements and specializations and utterly ignoring social claims and interests. Many are the passages in which he has raised a note of warning on this; and, to-day, we have the president of the American Association for the Advancement of Science telling us how seriously the warning is needed. How are we to bring down our speculations and researches to the level of popular comprehension? some of the mystifiers referred to by Professor Mendenhall will probably ask. Nobody wants you, we reply, says *Popular Science Monthly*, to bring down to popular comprehension that which cannot possibly be popularly comprehended; but we do want you to have, and show that you have, an interest in the general advancement of knowledge, and that you regard your specialty, whatever it may be, as simply a higher development of forms of knowledge that are within the popular grasp, and as being, if remotely, still vitally, connected with the practical concerns of life. If such is not the case, if, on the contrary, you are soaring in a region in which practical views have no place and no possible relevancy, then we make bold to say that your so-called science is merely a laborious and pretentious idleness. It is one thing to wander far afield in search of that which may at some time or another, if not immediately, prove of value to the human race. It is another and very different one to wander far afield for the acknowledged purpose of getting, not only beyond general comprehension, but beyond the sphere of all possible utility. The only condition on which science can claim the reverence of mankind is that it devotes itself to human service, and it rests with the serious students of science to make good this claim. In order that the relations between science and the age may be what they ought to be, the world at large must be made to feel that science is, in the fullest sense, a ministry of good to all, not the private possession and luxury of a few; that it is the best expression of human intelligence, and not the abracadabra of a school; that it is a guiding light, and not a dazzling fog.

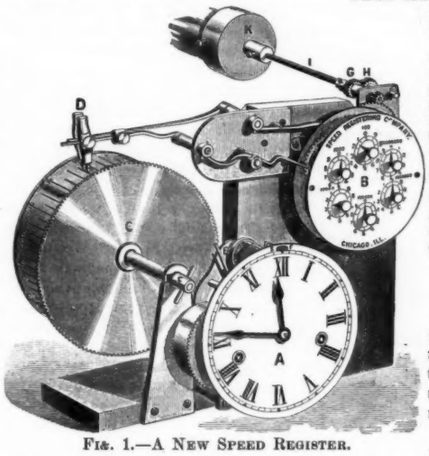


FIG. 1.—A NEW SPEED REGISTER.

A New Speed Register.

The Speed Registering Company, of Chicago, have put upon the market the instrument illustrated herewith. All users of motive power have often felt the need of just such a device.

The aim in the construction of this register was to procure a register and recorder of speed that would of necessity make itself invaluable as a means for keeping speed constantly up to a standard. The register, with its simplicity is complete, having a superior eight-day marine clock (double spring) of Seth Thomas make, carrying a drum, upon which is put the record band. The workings of the shaft are registered by the hammers that are lifted by lugs on meter gears, one every 100 revolutions, and one every 1,000 revolutions. The drum with the clock runs continually, accordingly the band being divided into 12 sections, and each section representing an hour, and fractions of an hour, the time of starting and stopping is assuredly registered, as are all stoppages, giving exact time and duration of stoppages.

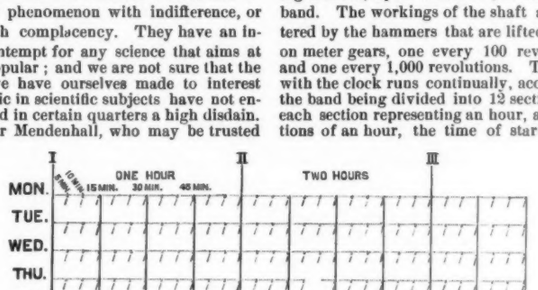


FIG. 2.—SPEED REGISTER, RECORD DIAGRAM.

.... A complaint was filed in the United States Circuit Court, at San Francisco, on November 26, by the government of the United States against the Southern Pacific Railroad Company and the Central Pacific Railroad Company and the Western Union Telegraph Company. The object is to secure the cancellation of the lease of the Central Pacific to the Southern Pacific Company, and also to secure the cancellation of the lease of the Central Pacific's telegraph lines to the Western Union Telegraph Company. In addition to the cancellation of the leases, the complaint demands that the line referred to be operated and maintained separately and independently, in accordance with the original agreement between the corporations and the government. In the document, which is withheld from publication until the court can issue the necessary processes, is the entire history of the relations between the Central Pacific Railroad, and it is sought to show that the railroad company has violated its pledges to the government in the matter of re-leases referred to.

TELEGRAPHIC

.... The American District Telegraph Company, of Omaha, Neb., has been sold and re-organized.

.... Four more wires will be strung between Dubuque and Sioux City, Iowa, by the Western Union.

.... The Western Union Telegraph Company has 49 miles of wire in Knox County, Tennessee. This is assessed at $6,384, giving a revenue of $66.83.

.... The American District Telegraph Company, of Council Bluffs, Iowa, has been sold to Mr. Fred. Davis, who will devote his time to its management.

.... Telegraph poles are being placed along the line of the Kearney and Black Hills road from Kearney to Calloway, Neb., and telegraph service may be expected in a short time.

.... The Board of Directors of the Philadelphia, Reading and Pottsville Telegraph Company met last week at the office of the Reading Railroad Company, in Philadelphia, and elected A. A. McLeod as president of the company.

.... Lewistown, Montana, is without telegraphic communication. An old government line used to be strung from Townsend to Fort Maginnis *via* Lewistown. It was sold at auction and bid in by a granger, who took the wire down and also cut the poles down. He used this telegraph wire and poles to fence in his ranch.

.... The telegraph operators throughout the State of Georgia, are endorsing the bill introduced in the house last week by Representative Boifeuillet. The following is a communication handed to him upon his arrival in Macon:

"MACON, GA., November 26.—Hon. J. T. Boifeuillet, Atlanta, Ga.—We, the undersigned telegraph operators of Macon and vicinity, hasten to express our utmost solicitude for the speedy passage of the bill introduced by you in the House to-day, prohibiting railroad companies in Georgia from employing any telegraph operator under 18 years of age, and who has not had at least one year's experience as an operator. Speaking from experience, we are in full sympathy with the bill.

"It is an indisputable fact that $\frac{9}{10}$ of the terrible railroad disasters attributable to telegraph operators in America are directly traceable to inexperienced and grossly ignorant and incompetent boy operators. And we hold that travel is seriously imperiled on any road where such service is permissible.

"In thus tendering our endorsement of your measure, we faintly voice the earnest sentiment of the fraternity, not alone in Georgia, but throughout the United States. The names hereto appended were all subscribed within an hour's time." A long list of names is appended.

Three Decisions.

From our contemporary, *The Office*, we cull the following legal news:

When a telegraph message is sent to one in the care of another, the company's obligation is fulfilled when they deliver the message to the one in whose care it was to be delivered.—Western Union Telegraph Company *vs.* Young, Supreme Court of Texas, 13 S. W. Rep., 985.

In an action to recover for failure to deliver telegram summoning physician to attend plaintiff's wife, the damages alleged were loss of wife's services. To recover it is necessary to show that the physician could have saved her life if the message had been delivered.—Western Union Telegraph Company *vs.* Kendzora, Supreme Court of Texas, 13 S. W. Rep., 986.

The business of a messenger company being to carry parcels and deliver messages for a consideration, they become charged with the liabilities of a common carrier, and when they undertook to deliver a team of horses and a carriage, they were bound to know that the agent whom they employed to make the delivery was able to handle the team, and they are liable for damages resulting from a runaway while in the custody of the messenger.—American District Telegraph Company *vs.* Walker, Court of Appeals of Maryland, 20 At. Rep., 1.

* * Newark, O., is to have a $50,000 electric street railway.

* * A Toledo, Ohio, firm is about to offer Jackson, Mich., $1,000 annually, for 19 years, for an electric street car franchise.

* * An electric railroad between Rockland and Thomaston, Me., is now said to be a sure thing. Work will begin in a few days.

* * The Street Railway, Light and Power Company's power house at Eau Claire, Wis., with all its machinery, was burned December 1. Loss, $25,000; insured.

* * The New York State Railroad Commission has approved the application of the Binghamton Street Railroad Company for permission to change the motive power on its entire route from horses to electricity.

* * The Thomson Electric Welding Company, of Lynn, Mass., has just built a machine, so arranged, that, by means of series of interchangeable clamps it will be adapted to a great variety of work. It can, therefore, be used by many small manufacturers who could not afford to put in large plants. It will be especially useful in machine shops, repair shops, railway car shops, carriage and wagon works, shipyards or anywhere where welding of a greater variety and quantity is now done by the old forge method.

* * A street railway company, whose line runs between Covington, Ky., and Cincinnati, has arranged with the Suspension Bridge Company, whose bridge across the Ohio connects those places, to run an overhead electric system across the bridge. The terms are the payment to the Suspension Bridge Company of $32,850 for tolls per year and the assumption of responsibility for all damage resulting to vehicles or passengers from the construction of the electric wires across the bridge. The Street Railway Company will run 500 cars per day across the bridge.

* * A certificate of the continuance of the corporate existence of the Buffalo, N. Y., Street Railroad Company, was filed with the Secretary of State last week. The term of the corporate existence of the company when first incorporated, on April 6, 1860, was for 100 years. The certificate just filed extends the term of the corporate existence of the company for 899 years beyond the time named in the original articles of association of the company, or from April 6, 1960. The company has a capital of $100,000, and the certificate of extension is signed by Richard W. Clay and Edward E. Dennister, of Philadelphia, who, respectively, hold 495 and 500 shares of the stock of the company.

* * Among the decisions recently handed down in the supreme court were those of Fred. S. Potter *vs.* the Saginaw, Mich., Union Street Railway, and that of Sarah C. Barber against the same company. The cases were begun by these parties for the purpose of preventing the railway company from operating its road by electric power past their premises on the west side of the river, and have been pending for about a year. The hearing was had first before both of Saginaw's circuit courts, and testimony was offered by over 100 witnesses. Arguments consumed several days, and Judges Edget and Gage rendered decisions in favor of the railway company. The cases were appealed to the supreme court and the decisions of the lower courts were affirmed.

* * A press despatch dated Schenectady, N. Y., December 2, is as follows: "The Edison General Electric Company here has been putting in a new battery of boilers. This necessitated some temporary device for furnishing the immense works with steam. Superintendent Turner was equal to the emergency. He went to Albany and contracted with Superintendent Hammond of the Delaware and Hudson Railroad for a locomotive, which arrived here this evening. It has been placed in the yard of the Edison works, and steam pipes are now being run from the locomotive to the main steam pipes leading to the company's engines. The locomotive is expected to furnish auxiliary power sufficient to run the entire works and keep the force of 3,000 men at work. Old mechanics here say this is the first time to their knowledge that a railroad locomotive has been thus utilized."

* * Prof. R. H. Thurston, in a recent article, gives a graphic description of what electricity will do in the near future. He says it will break up the present factory system, and enable the home worker once more to compete on living terms with great aggregations of capital in unscrupulous hands. Great steam engines will undoubtedly become generally the sources of power in large cities, and will send out the electric wire in every corner of the town, helping the sewing woman at her machine, the weaver at his pattern loom, the mechanic at his engine lathe, giving every house the mechanical aids needed in the kitchen, the laundry, the elevator, and at the same time giving light and possibly heat in liberal quantity and intensity. He might very appropriately continue the list, and point out that the office man is likely as well to be benefited in the coming revolution, says *The Office*. There are a hundred things that electricity will ultimately do in and about offices, which are now clumsily done by other means.

Removal of the Heisler Company.

The proprietors of the Heisler system of long distance series incandescent electric lighting have found it necessary to transfer the manufacturing of their apparatus from St. Louis to their new and commodious works located at Gloucester, New Jersey, where with enlarged space at their command, and increased facilities, they will be enabled in the future to meet the constantly increasing demand for their apparatus.

The extensive introduction and adoption of this system within the past two years for commercial, street and alley lighting, has made it necessary to increase the manufacturing facilities. It is recognized among those most interested in incandescent installations, where it is necessary to distribute lights over large areas, that the Heisler system fully fills the requirements. The Heisler system's merits are fully recognized and overcome very serious conditions by making it possible to distribute any number of lights, from 160 thirty-two candle-power lamps to the full capacity of the largest dynamos, over an area of territory that could only be covered by 50 miles of No. 8 B. & S. gauge wire, and suffer no drop in the candle-power of the lights, the lamps furthest away burning as brightly as those nearest the dynamo, and the loss due to the resistance of the line (8 B. & S.) being equal only to 32 candle power lamp per mile.

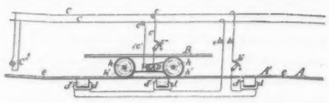
The efficiency of the dynamo under these conditions makes it possible to obtain six and a half 32 candle power lights per mechanical horse-power expended, less the friction load of the dynamo, producing a white and brilliant steady light. The improved automatic regulator used in connection with this system controls and maintains a steady and uniform light, and at the same time dispenses with all translating devices in the station and upon the circuits. The only device (other than the dynamo) used in the installation of the Heisler light is the improved combined automatic cut-out and lamp socket, a perfect device in itself, being adapted to hold any sized lamp from 10 up to 150 candle-power, containing no parts liable to get out of adjustment, and the cut-out feature is always accessible for removal without the liability of interrupting the circuit while manipulating the same. The housing of the socket is composed of insulating material and the cut-out can be renewed at cost of less than one cent.

The company continues a St. Louis agency where there will be kept on hand a supply of lamps and materials for repairs, as well as emergency experts, whose duty it will be to look after the various installations west of the Mississippi River. Drexel Building, Philadelphia, will be the company's headquarters hereafter.

PROGRESSIVE ELECTRICAL INVENTIONS.

ELECTRO-MAGNETIC TRACTION.

Various systems have been proposed for increasing the traction of railway trains by means of electricity or magnetism, some depending for their operation upon magnetic polarization of the wheels or upon a fixed magnet carried by the train, others operating by means of a heavy current passed through the wheels and rails, probably creating incipient fusion at the line of bearing. In the accompanying engraving is illustrated a departure proposed by Mark W. Dewey, of Syracuse, N. Y., in which the increased tractive effect is produced by electro-magnets, but instead of placing the magnets upon every train that passes over the road and thereby incurring a large outlay for electric apparatus, the inventor proposes to place a magnetic system in the road-bed itself at those points where increased traction will be needed; for example, at heavy grades where the road-bed passes over canals or other obstructions. As ordinarily the greater portion of the railway is level or substantially so, cars traveling thereon do not need increased traction, so that the points at which the magnetic appliances will be needed are comparatively few. The invention is particularly applicable to cases in which the cars are electrically operated and where a sufficint supply of current will always be accessible. A series of coils are distributed at intervals along the grade and have their cores connected to the rails in such a way as to induce a north polarity in one rail and a south polarity in the other. When the wheels roll upon the magnetized rails they form through the axle a path for the lines of force developed in the stationary cores and rails and thus create a magnetic "stick" between the wheels and the rails which largely augments the amount of traction.



ELECTRICAL RANGE FINDING INSTRUMENT.

An interesting device for determining the distance of an inaccessible object has been recently patented by John Rapieff, of New York. This is another of the many useful applications of electricity to the science of war. The instrument comprises, as will be understood from inspection of Fig. 1 of the accompanying diagrams, two telescopes mounted so that they can be brought in line with the object, the distance of which it is desired to know. Each telescope is mechanically connected by means of a gear-sector 4 and a worm 3 with a shaft which carries an interrupting-wheel 15 adapted to open and close an electric circuit, including an electro-magnetic device for rotating an indicating arm in synchronism with the movements of the telescope. Each of the telescopes controls an independent indicator by means of separate batteries D D¹. When the handles 14 are turned to train the telescopes into alignment with the distant object, one of two contacts 13 will be brought into connection with one of the two wires 11, 12, according to the direction of motion; thus, if the handle were turned in one direction, the circuit would be made with wire 11; if it were turned in the other direction, the circuit would be made with wire 12, these wires establishing communication with separate electro-magnets 60, 61, see Fig. 2, which electro-magnets rotate, step-by-step, co-operating ratchet wheels 41, 42 which operate upon the indices 150 by means of a "sun-and-planet" device, as illustrated in Fig. 2. It will thus be understood that as either telescope is adjusted to its proper position the circuit of either electro-magnet 60 or 61 is successively interrupted by the wheel 15, and a rotary movement is imparted to the indices so as to cause them to follow the movement of the telescope. The indices are placed over a chart upon which lines are drawn and distances marked, and the distance of the objects will always be determined by the distance from the center of the chart to the point of intersection of the two indices. Of course, the indices and the chart may be located at any point or at any angle with respect to the telescopes themselves, the position shown in the diagram being selected merely for convenience of illustration.

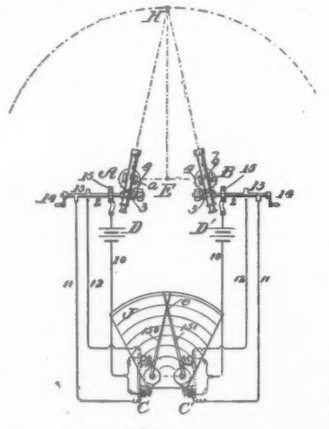


FIG. 1.

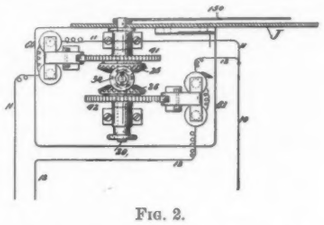


FIG. 2.

Mr. Rapieff has devised several other methods of finding ranges, involving as their operative principle two telescopes set at an angle to each other but in fixed alignment, one or both of which may be slid along a guide until the distant object lies in the field of vision of both, means being provided for magnifying the distance of travel so that the indication may be easily read. This magnifying is accomplished by attaching a series of contacts to the sliding telescope, these contacts bearing on a series of wires so that more or less of each wire will be cut into one circuit of a differential galvanometer, the balancing circuit of which includes a wire of the same character as the series above mentioned placed along a scale and provided with a sliding contact. By adjusting the latter contact until an exact balance of the galvanometer needle is produced, the distance apart of the telescopes is easily read, thus giving a known base line and known angles of a triangle from which the distance of the object may be trigonometrically computed. The reading of the base line may, if preferred, be magnified by gearing operated by a cord connected to the movable telescope.

Marriage Bells.

Mr. George A. McKinlock, secretary and treasurer of the Central Electric Company, and Miss Marion Rappleye were married at the residence of the bride's parents, in Chicago, on the evening of December 2d. The wedding was a quiet one, only the immediate relatives and friends of the contracting parties being present. Prominent among the many handsome presents was an elegant and complete solid silver dinner set, consisting of 89 pieces, in an antique oak cabinet.

This gift was presented by Messrs. H. Durant Cheever, George T. Manson and Willard L. Candee, of New York, and was accompanied by a congratulatory letter to the groom.

The employés of the Central Electric Company presented Mr. McKinlock with a handsome field-glass.

Mr. and Mrs. McKinlock left Chicago at 12:20 P. M., on Wednesday, for New York, and sailed on Saturday, December 6, on the "Etruria," for an extended tour abroad, spending the Winter in Italy.

The Electric Light Plant in Allegheny City, Pa.

There is, perhaps, no other electric lighting plant in this country where an equal amount of lights are operated from such a small central station building as is done in the plant of Allegheny City, Pa. The plant is owned by the city and it operates the alternating system exclusively, both incandescent and arc lights; and it is mainly for this reason that the company was enabled to run such a large capacity of lights from a comparatively small power house.

The plant has a capacity of 4,500 incandescent and 540 arc lights. It was established last Spring; and the contract for the installation of the electric light system was awarded to the Westinghouse Electric and Manufacturing Company.

The power house is a very handsome brick building situated near Braddock street and the tracks of the Pittsburgh, Fort Wayne and Chicago Railroad. The roof of the building is graced by a beautiful tower from which the main wires are distributed.

The boiler room is in the rear of the building containing a battery of six tubular boilers, each measuring 16 feet in length with a diameter of 66 inches. Slack coal is utilized as the fuel under the boilers and each of the latter are also fitted with a Roney patent stoker. The utility of this appliance has manifested itself in this plant to a very great extent from an economic point of view.

From the boiler room a small door leads into the power house proper, the dimensions of which are 50x56 feet, and in this space the entire amount of the engines and dynamos for the operation of the complete plant are confined, as follows: There are seven 100 horse-power Westinghouse compound engines, one 85 horse-power compound engine, two 15 horse-power automatic engines, three 1,500 light alternating current incandescent dynamos, two exciters and nine 60 light alternating current arc machines.

The switchboard of both the incandescent and arc light circuits occupies the greater portion of the north side wall in this room, containing all the switchboard appliances used in connection with the Westinghouse system of electric lighting.

The plant has been in operation since the fifteenth day of July last, and since that time there has never been any interruption in the service, either in the incandescent or arc light supply.

The working of the central station is superintended by Mr. David Hunter, Jr., and Mr. Maurice Coster acts as chief engineer.

The arc lights are used to light up the streets of the city. All the construction work in this direction was done by the North American Construction Company.

The lights are distributed by mast arms and towers. Of the latter, the city has put up 53 with five lights on each and the rest of the lights are on mast arms.

The lights have given every satisfaction to the people of Allegheny City, and the effects of the illumination from the towers is rendered very brilliant. Since the plant has been in operation, the city has realized that the present capacity of the station is hardly sufficient to meet the demands of the entire place and an extension is already contemplated.

New Offices of the International Okonite Company (Limited).

The new factory of the International Okonite Company (Limited), at Passaic, N. J., being practically finished and in running order, this enterprising and progressive concern have turned their attention to improving their New York headquarters at 13 Park Row. By the acquisition of three or four more rooms in addition to those formerly occupied by them, they now have every facility for the systematic and expeditious carrying on of their immense business. The new offices of the company, while artistic in all their fixtures, have an air of propriety and business comfort which prevent any idea of display entering the visitor's mind. As you step from the elevator at the fourth floor of the building, 13 Park Row, you are landed immediately in front of the entrance to the company's quarters. Opening a door you enter a reception or waiting room. This reception room is artistically and comfortably furnished. In the center is an immense table of finely carved and polished oak on which are scattered the latest issues of all the electrical journals. Comfortable leather-cushioned oak chairs and an oaken settee—a very artistic piece of work—complete the furnishing. The offices of the Okonite Company comprise six sections or departments, formed by partitions and artistic railings. These partitions are in themselves the main decorative feature of the suite of offices, being of highly polished carved oak, the upper portion of dull glass, and surmounted with a decorative miniature railing or cornice.

The private offices of Capt. Willard L. Candee, George T. Manson, Mr. H. Durant Cheever, and sales agents' quarters, are at the further end of the reception room. The general sales agents, Mr. T. McCoubray and assistants, occupy an oblong room which forms a sort of hall between the private and general offices. The whole suite of offices is lighted by electricity. At one end of this hall or room are stationed the safes, telephone cabinet, etc.

To the left of this department and facing the busy thoroughfare, Park Row, are the private offices of Captain Candee, Mr. Manson and Mr. Cheever. They comprise most of the space occupied by the old quarters of the company. Artistic lettering on the glass panel of the door will tell you that Captain Candee occupies the first room, Mr. Manson the second and Mr. Cheever the third. These rooms are well-lighted, equipped with desk, chairs and cabinets of finely carved and highly polished oak. Communication from each of these offices is made to the department presided over by Messrs. Hodgins, Brumley and Ashton, by means of push-buttons and speaking tubes, all of which allows the great business carried on by this concern to be done expeditiously and without noise or confusion.

The financial or business part of the Okonite Company offices is located at the farther end of the reception room, and on its right, as one enters. A finely wrought oaken railing separates this department, of which Mr. Hodgins is the head and leading spirit, from the rest of the office. Once past this gentleman's desk, which is situated at the entrance, you notice at once the admirable and comfortable arrangements made for the working force of clerks, bookkeepers, stenographers, etc. There is a place for every one and everything. Communication between the several departments here represented and Mr. Hodgins are made very complete by the aid of push-buttons and speaking tubes.

The International Okonite Company in their present quarters can safely lay claim to an office which, in point of convenience and elegance, is not surpassed by any of its size in the city and such an office as a firm of their commercial importance fully deserves.

New York Electrical Society.

Mr. Edward P. Thompson, a patent attorney of this city, lectures before the Society this week in the hall of the Society of Mechanical Engineers. His subject: "How to Make Great Inventions; or, the Science and the Art of Inventing."

A Question of Color in the South.

A queer phase of the electric light crops out in Georgia, where the Atlanta *Journal* remarks: Did you ever think of this? The electric light is a very brilliant thing, to be sure, but you cannot stand a square off and tell the color of a man or woman who is walking under an arc light. Try this and tell me why it cannot be done.

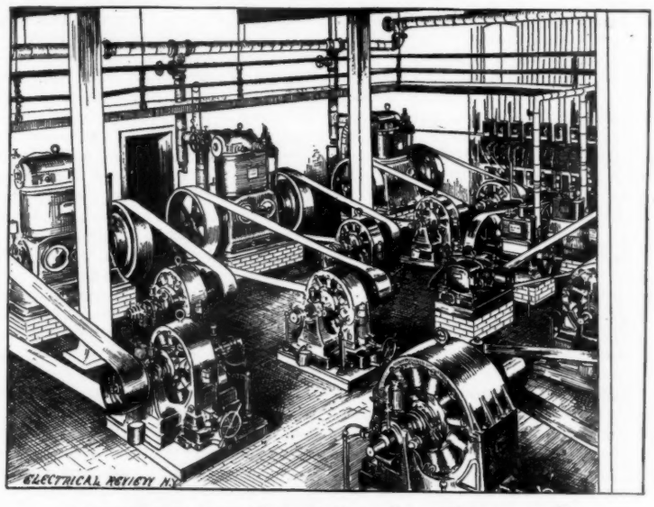
—— The electric lighting company of Newark, N. J., has received orders from the superintendent of public lighting to raise all lights in front of stores to a height of nine feet at least.

—— E. C. Converse, general manager of the National Tube Works, at McKeesport, Pa., and others, have applied for a charter for an electric light company, to be known as the People's Electric Light Company.

—— The Pasadena, Cal., Electric Light and Power Company has notified the city authorities that after December 15, next, it will be impossible to furnish lights for the city without a contract for one or more years.

—— An electric light company, acting under contract with the municipal government, has introduced the electric light for public and private purposes in the town of Panama. The lighting of the streets is effected by 43 arc lamps, and 300 incandescent lamps are installed in private residences.

—— A syndicate of Pittsburgh capitalists have filed a claim on the San Gabriel river, from the Victoria mines to Cattle Canyon, with a view to putting in an immense electric light plant to supply Pasadena and Los Angeles, Cal. The water will probably be flumed to both of these places, and a gigantic plant established at some suitable site in the great San Gabriel Valley, so that all the towns in that country can be supplied with water and light.



DYNAMO ROOM OF THE ELECTRIC LIGHT PLANT, ALLEGHENY, PA.

—— Two electric light companies have entered the field at Blairsville, Pa., where there is said to be room only for one.

FINANCIAL.

Closing quotations of electric stocks, from F. Z. Maguire & Co., Electrical Securities, 18 Wall street, N. Y., Saturday, December 6, 1890. New York, Boston and Washington Stock Exchanges. Pittsburgh closing December 5, 1890.

NEW YORK.	
Western Union Telegraph Co	74.
American Telegraph & Cable	88.
Central and South American	155.
Mexican	210.
Commercial Cable Co	
Postal Telegraph Cable	30.
Edison General Electric Co	70.
" " " Deferred	
Consolidated Electric Light	
Edison Electric Illuminating Co	68.
United States Electric Light	30.
North American Phonograph	30.
BOSTON.	
Thomson-Houston Electric Co	39.
" " " Preferred	93¼.
" " " Series C	
" " " Series D	5½.
" " International Co	
" Welding Co	
" European Welding Co	
Ft. Wayne Electric Co	10½.
TELEPHONE:	
American Bell	199¾.
Erie	
New England	
Mexican	.65
Tropical American	
MISCELLANEOUS:	
Edison Phonograph Doll	1½.
WASHINGTON.	
Pennsylvania Telephone	25.
Chesapeake and Potomac	
American Graphophone	11¼.
United States Electric Light (Washington)	132.
Eckington and Soldiers' Home Electric Ry	57½.
Georgetown and Tennallytown	47.
PITTSBURGH.	
Westinghouse Electric Mfg. Co	16¾.

—— The machine shops of the Heisler Electric Light Company, at St. Louis, were damaged by fire one day last week to the extent of $5,000. The loss is covered by insurance.

—— The Edison Electric Illuminating Company, of Lebanon, Pa., has declared a semi-annual dividend of four per cent. payable December 1st, and has applied during the past year over $3,700 of earnings to new construction.

—— Though the Westinghouse Air-Brake Company is now making profits at the rate of $2,000,000 a year, says a Pittsburgh daily paper, the head of the company thinks its future does not compare to that of the Westinghouse Electric Company.

—— The Thomson-Houston system will be used for lighting Elyria, Ohio. W. R. Caulkins, agent of Central Thomson-Houston Company, at Cleveland, has secured a five year contract for Cleveland parties. One hundred arcs and 650 alternating will be required. A very snug order to turn in.

—— The Massachusetts Gas and Electric Light Commissioners last week published a decision denying the petition of the Worcester Gaslight Company, for authority to engage in the business of electric lighting. The company proposed to buy out the electric light plant at Worcester.

—— Judge Goebel has granted the application of the Queen City Electric Company, of Cincinnati, for authority to lay conduits in the streets and alleys of the city for electric wires. The granting of this privilege is in accordance with the decision in the matter of the application of the Edison General Electric Company.

—— The Grand Junction, Col., Electric Light Company have completed the purchase of ten lots for a consideration of $2,000. They will at once commence the erection of a power house on this tract, and will have their new dynamos in operation in 60 days. This plant will also furnish power for the new electric motor line to Orchard Mesa heights.

—— Bad boys are breaking the incandescent electric street lights in great numbers on the outskirts of Passaic, N. J., by means of slung-shots, air guns and other appliances. The company think they can trace some of the boys, and if so a term in jail awaits them. There is a standing reward of $25 for information that will convict anybody of damaging street lamps.

—— The Union Electric Lighting Company of Franklin, Mass., which furnishes the town with electric light, is now understood to be under the control of the Thomson-Houston Company. M. W. Turner, who has been treasurer, has sold his interest, and William A. Cary now fills the position. H. W. Burgett remains president of the company, and a small portion of the stock is retained in the town.

—— A company is to develop the water power at Kelley's Falls on the Piscataquog River for the purpose of operating a new electric light plant, to be devoted wholly to incandescent lighting. A 12-foot dam has been built and two large Rodney-Hunt turbine wheels have been put in, leaving room for two more. An effort will be made to bring new industries to the section to be supplied with electric power. Wires will be strung to Manchester, N. H.

—— The large new steel lighthouse supply steamer "America" arrived at Tompkinsville, S. I., last week from the yards of her builders. The "America" is 1,400 tons register, 216 feet long over all, 35 feet beam, 17 feet depth of hold, and 12 feet 6 inches draught when loaded. She is fitted with two screws. Her engines are of the latest compound type of 1,300 horse-power. She will develop a speed of 14 knots per hour. The new steamer is schooner rigged, has three decks, is fitted with electric lights, electric bells and steam steering gear. Her cost is $187,000.

A TRULY ELECTRICAL DINNER.

A SOCIAL GATHERING OF ELECTRICAL MEN THAT WAS MOST PLEASANT AND HIGHLY PROFITABLE.

The first of the series of dinners which are to alternate every two weeks with the regular monthly meetings was given at the New York Electric Club, Thursday evening, December 4. The repast was beautifully served by the club's steward, and the menu was the daintiest imaginable. About 60 members and their guests were seated along the flower-bedecked table, which extended the length of the double parlors.

Among the gentlemen present were: Gen. O. E. Madden, Erastus Wiman, W. D. Sargent, Jos. Howard, Jr., E. E. Bartlett, T. McCoubray, W. L. Candee, Foster Coates, C. E. Stump, F. Z. Maguire, T. C. Martin, P. H. Alexander, J. M. Orford, W. C. Bryant, U. N. Bethel, Stephen L. Coles, Robt. H. Read, Jos. Wetzler, M. W. Sullivan, H. D. Stanley, C. A. Hamilton, Mr. Cordier, Mr. Adams, Boston; Mr. Appleton, G. Worthington, E. B. Baker, C. D. Shain, Mr. Shain, Sr., E. F. Peck, C. M. Peck, Fred. W. Royce, Washington, D. C.; C. O. Baker, Jr., C. E. Chapin, Geo. B. Coggeshall, Capt. E. L. Zalinski, U. S. A.; Herbert Laws Webb, Geo. T. Manson, S. M. Bryan, Washington, D. C.; Fred. J. Boynton, Boston.

The post-prandial exercises were inaugurated by General O. E. Madden, president of the club, calling upon Captain E. L. Zalinski, U. S. A. General Madden said that as Captain Zalinski had been transferred under army orders from his work in the East to new fields on the Pacific slope, this would be the last opportunity which the members of the club would have to hear him, and it was with pleasure, not unmixed with regret, that he called upon him for what would be his farewell speech.

Captain Zalinski, in feeling and well-chosen words, spoke of his pleasant life here in the East, especially at the Electric Club. He thanked the members individually and collectively for their kindness to him and hoped some day to see them all at the "Presidio" in California, which would be his abiding place for the present. At the conclusion of Captain Zalinski's remarks he passed around the table and, with a clasp of the hand, said good-bye to each one individually.

General Madden then called upon Mr. Erastus Wiman, vice-president of the club, who had agreed to act as master of ceremonies for the evening. Mr. Wiman expressed his interest in and appreciation of the work done by the club and excused himself for not being a more frequent visitor, on account of his living at a distance from the club house, namely, on Staten Island. He said he frequently had the pleasure of being present at dinners with Mr. Chauncey M. Depew. Mr. Depew on several occasions had called attention to the fact that it was 10 o'clock and time for Wiman to go home. Mr. Depew had spent one night on Staten Island and had not slept a wink. Mr. Wiman referred to the all-pervading influence of electricity in all the walks of life, and referred to the fact that this, one of the most potent of the influences which move the world, should have remained unknown for so long a time. He also made interesting mention of Dr. Koch's discovery, and the discovery of chloroform, petroleum and natural gas. He gave an interesting account of a conference held in this club at which he was present, when an engineer of the West End Street Railway Company, of Boston, came to New York to investigate electricity as applied to street railways. This was three years ago, and now Boston possesses the largest and best equipped electric street railway system of any municipality in the world. In speaking of the telegraph, he mentioned the fact that he and his firm spent over $100,000 a year in telegrams alone. He related an anecdote of a friend of his who went recently to the Rio Tinto mines, in Spain. While there he came across some interesting relics which were once the property of Queen Isabella. Among these was a jewel case perfectly preserved. This was the box which contained the jewels which Queen Isabella pawned to obtain the wherewithal to send Columbus on his voyage of discovery. This discovery would be fittingly celebrated in a few years by the World's Columbian Exhibition. Mr. Wiman spoke of how much we have to be thankful for to Queen Isabella, in that she made it possible for the hardy explorer to discover and found a country which has done so much in forwarding the developments in electrical science. He doubted if anything had been more abused than electricity. More fortunes had been lost than made in the electrical field. He spoke of having been present at a lecture which Professor Bryce had given a short time ago in Brooklyn. One sentence which he used had remained firmly fixed in Mr. Wiman's mind. It was this: "We are losing our faith in individualism and we are increasing our belief in collective action." This, Mr. Wiman thought, would apply to work in the electrical field; if there was anything needed it was collective action

Mr. Wiman spoke about the necessity of electric traction in New York. He said we were now threatened with a cable system to be built on Broadway. To his mind nothing more serious could happen to the city of New York than the building of a cable railway on Broadway. He could readily see how a cable in a wide street, such as some of those in San Francisco and Broad street, in Philadelphia, could be of great service; a cable railway in a street as narrow as Broadway, however, where a constant stream of vehicles passed up and down on each side of the street the whole day, would prove a disaster. The system was so inflexible and possessed such serious defects as to preclude its successful use in a crowded thoroughfare. He thought the electricians of New York ought to combine and protest against this cable road. The speaker hoped at some future day to see electric cars each equipped with an independent motor, and put forth the problem of the development of the storage battery as one offering a wide field for invention and research to the young electrician of to-day.

Mr. Wiman's remarks were received with great applause. He then said that his first pleasant duty was to introduce Mr. Joseph Howard, Jr., who responded somewhat as follows: Mr. Wiman had in his remarks covered the whole field of creation. He had referred to the Standard Oil Company, and had tried to "bear" Broadway stocks. (Laughter.) Mr. Wiman had touched upon everything known to God, man and the devil, and had not exhibited the least toastmasterial generosity. He evidently expected every speaker who followed him to be a little rag-tag to the tail of the kite that booms. (Much laughter.)

Mr. Howard said he was here to-night to make a plea for comradicity. New York will never be a city of clubs. We have no leisure class, thank God, as they have in England, and this might account for the lack of comradicity in a small degree. He thought that this club—the Electric Club, of which he was proud to be a member—might be taken as a starting point for a non-political club where there was no dudism and where menuistic delights were a secondary consideration. Of such a club the city might in time be proud. Electricity meant something to him. It must be that force which enabled him to get up every morning and do a hard day's work, which he did 365 days in the year, and possess the same nerves at 58 years of age that he had 30 years ago. He did not understand much yet about electricity, but he did thoroughly understand comradicity.

As a member of this club Mr. Howard congratulated himself, and wanted to know why we could not make this club a radiator which will teach other clubs fraternality along every line? There had not been an electric lineman in New York broiled to death, except through his own carelessness. Party politics had involved the development of electricity in this city to a considerable degree. As an illustration of this, he quoted the fact that Richard Croker and his compeers have condescended to tell us who shall rule this town. Then Mr. Croker had gone to Germany. Mr. Bourke Cockran had recently also gone to Germany to ask Mr. Croker for to come, for to go, for to tell him if he, Mr. Bourke Cockran, could be Senator in place of Mr. Senator Evarts. (Laughter.)

Mr. Howard concluded his remarks by stating that the Electric Club had served one of the best dinners he ever partook of, that it had a handsome house in a respectable neighborhood (he lived just around the corner), that it had a bully start, "and let's go in and make it a model club."

Mr. Howard's characteristic and extremely entertaining remarks received a hearty round of applause—in fact, he was continually interrupted with applause.

The master of ceremonies then called upon Mr. Franck Z. Maguire, who, he said, would favor the assemblage with a few chords upon the piano. Mr. Maguire responded by playing "La Danse Electrique," which he had composed especially for the occasion. It is a charming waltz, which the author has dedicated to the Electric Club.

Mr. T. C. Martin, of the *Electrical Engineer*, was the next speaker, and responded to the sentiment of "The Fire-fly." Mr. Martin said that he had asked the secretary to favor him with some sentiment on which he could speak. The secretary had said that he would leave that to Mr. Martin's own option. The speaker then told how one of his colleagues had entered the editorial sanctum on a very cold day, and, as he was turning down the collar of his ulster, proposed that Mr. Martin take Maybugs for his subject at the club. Mr. Martin said that as "Out of the mouth of babes and sucklings wisdom shall come," he had upon this idea decided to speak about the fire-fly. He thought it would be well if the electricians of to-day did not discover the source of light in the fire-fly, so that the coming age would not look back with bitterness to the fact that all the great inventions were exhibited at the Cook County Fair. Speaking of light without heat, he thought the work of the club was to dispel darkness. You cannot discuss electricity without taking the world as your province. Mr. Wiman's remarks he thought were made in this strain. There was a great deal of misinformation concerning electricity distributed broadcast in the land. He thought the lay press was somewhat to blame for this. In nearly all the reports of the cabinet ministers recently printed some reference was made to electricity. Mr. Martin thought that rapid transit in New York was a complete misnomer, for there is no such thing here.

Mr. Martin's polished and interesting address was attentively listened to. Mr. Wiman thought this affair had developed into a press night. He was glad of that, because he had been a journeyman printer for five years himself. In a few days he was going to the New York *World* office and set up a stick of type in his shirt sleeves. He would call upon another representative of the press, Mr. Foster Coates, the able young managing editor of the *Mail and Express*.

Mr. Coates said that his present position reminded him of the man who, when called upon to speak, said that he had left his speech at home, and a man on the other side of the table had thereupon remarked: "Thank God for that!" It also reminded him of the country editor who was once short of editorial paragraphs and filled in with one something like the following: "If we could only get the thoughts which come to us at midnight on paper in midday, what a great country this would be."

Mr. Coates thought that in this hurrying, scurrying world we ought to take advantage of all such occasions as the present and let up a little in the chase for the almighty dollar. He spoke of the man who was so busily occupied in accumulating this world's goods that he never got a chance to sleep; so he had the following sign placed over the head-board of his bed: "Please, Mr. Gabriel, do not blow your horn; I want to sleep." The speaker said that he did not know anything about electricity. He would suggest that the members of the Electric Club arrange it so that a little more electricity might be put into the boy who brought the telegrams and a little less into the young lady who received them. ("Shame! Shame!" from Howard.) Mr. Coates thought that instead of having monuments erected over us after we were dead and flowers placed upon the coffin, that we erect our monuments now by extending the hand of fellowship to all good fellows and having our flowers in our homes. He did not want any stone over him when he was dead, but he did want all the flowers he could get in this life. He had always been sorry that he had been born in this century; the next one would be so much better to live in.

Mr. Wiman called upon Mr. Howard for one of his journalistic experiences, and Mr. Howard responded with a very funny story of the "beat," which he obtained for the New York *Times* when the Prince of Wales made his tour in America. Mr. Howard's co-conspirator in this affair was the famous Fiske, of the New York *Herald*, and these two bright journalists monopolized the telegraph wires by sending long passages from the Bible to their home offices in New York, until their own news was safe and the other correspondents had become weary of waiting for a chance at the wire.

Mr. Wiman, before calling on the next speaker, related an anecdote of John Bright, who said that every speech of his caused him the loss of two nights' sleep—one before making the speech thinking of what he would say, and the other after the speech thinking of what he could have said.

Mr. P. H. Alexander was the next speaker and spoke upon the Electric Club. He made his home here at the club and spent more hours inside of it than outside. This gave him opportunities of observing men and things which some other members did not have. His idea of the club was that a man frequents it not to discuss business, but to forget it. He made a plea for the members to frequent the club more than they had been doing.

Mr. Adams, of Boston, made a few interesting remarks, some of which were very complimentary to the president of the Electric Club. General Madden closed the speaking with a few words. He had been a member since the club was organized, and his interest in the club has always been intense, and he would like to be permitted to say without egotism that he had worked harder for it than for any other organization with which he had ever been connected.

Mr. Wiman thought that the club was the nucleus for centralizing an interest in electricity throughout the country, and stated that he would do anything within his power to aid the club to this end—and then the dinner and feast of good things was over.

National Electric Manufacturing Company.

This company, whose home office is in Eau Claire, Wis., was organized about a year ago, and the wonderful business it has already built up places it among the few large and influential electric lighting companies. The transformer system, as embodying the latest advances in the art of electric lighting, is employed.

The business has grown until it has become necessary to establish 11 branch offices and agencies for the sale of apparatus. The branch in New York is located at 50 Broadway, under the title of the National Electric Manufacturing and Construction Company, and is now putting in a plant of 2,000 lights at Jamaica, L. I, and one of 1,000 lights at Dover, N. J. The business in this territory, under the management of Mr. Latshaw, is growing so fast that a factory is about to be established at Troy, N. Y.

The Oerlikon Company are putting in a plant for a long-distance transmission of power on the Kapp system for the Frankfort Exhibition at 10,000 volts. The current will be generated at ordinary alternating current pressure, about 2,000 volts, and transformed up to the 10,000 volts, transmitted along bare overhead wires carried on oil insulators, and again reduced at the exhibition end.

Ideal Compound Engine.

The illustrations accompanying this article show the latest production of A. L. Ide & Son, Springfield, Ill. The following description of the Ideal compound engine will be interesting to electric light men, for whose benefit the engine was especially designed.

It has a heavy self-contained main frame with overhanging wheels, all bearings being self-oiling with working parts enclosed, which insures thorough and continuous lubrication, thus reducing the wear, preventing hot bearings and effecting a great saving in oil and attendance.

The Ideal engines are guaranteed to run smooth and noiseless without perceptible vibration, and not to shake nor move on foundation while running at full speed and full load with all anchor bolts removed, and that the speed will not vary two per cent. when working under extreme changes of load. The cylinders are arranged on the well known tandem plan, and are so proportioned as to give the highest efficiency. The low pressure cylinder is bolted direct to the engine bed, and to the head of this cylinder is cast the high pressure cylinder. By this arrangement steam from the high pressure cylinder has a short, direct passage into the low pressure cylinder, without suffering the loss of heat by passing through connecting pipes or receiver. Another great advantage of this arrangement is that four stuffing boxes are dispensed with on the piston and valve rods between cylinders, reducing the friction and radiating surfaces.

The head between cylinders is cored out leaving a space which is filled with a non-conducting compound. This effectually prevents the heat from passing through, thus securing the prime object of compounding, viz., a uniform high temperature in the high pressure cylinder. Both cylinders and steam chests are encased with a handsome finished panelled iron jacket with two inch air space between cylinder and jacket which is filled with non-conducting material. Both cylinder heads are protected in the same manner.

Both valves are controlled by the governor and are on the same stem, moving together, and varying in stroke as the load and steam pressure varies, thus giving the great advantage of automatic cut-off in both cylinders and dispensing with the complication of double eccentrics, rocker-arms, slides and stuffing boxes, all of which require packing, oil and attention.

The high pressure cylinder has a piston valve the same as is used on all Ideal engines, but double ported on the compound in order to give larger areas for the free admission of steam. The low pressure cylinder has a flat balanced valve, traveling under a cover and supported on hardened steel rollers and so arranged that steam is admitted through three ports, thus giving a quick wide opening at the beginning of the stroke in order to reduce the pressure on the exhaust end of the high pressure piston. The cover of this valve is held in place by a spring and will lift and prevent excessive pressure in the cylinder from water and other causes. Provision is made for conveniently adjusting the cover to take up wear so that the valve will always remain steam tight.

Both valves are perfectly balanced, and with full boiler pressure can be moved by hand with ease. The steam ports are very large, short and direct. The valves have a long travel, giving a quick opening and close. Cards taken from the engine show that full steam pressure is maintained in both cylinders up to the point of cut-off, giving a straight steam line as obtained by the use of Corliss valve gear. The Ide governor is used. Eight years' use on over one thousand engines has fully demonstrated its ability to perfectly regulate the speed of the engine under the most exacting conditions. The Ide governor is susceptible of equilibrious adjustment. When so adjusted the dash-pot affords the necessary stability to insure isochronous action and regulation of speed. By recent improvements the use of oil on the governor is dispensed with, which prevents the throwing of oil and damage to belts. All parts of these engines are fitted to standard templets and gauges and are interchangeable. The engines are shipped on heavy iron foundation base with driving wheels on, and are ready for immediate service.

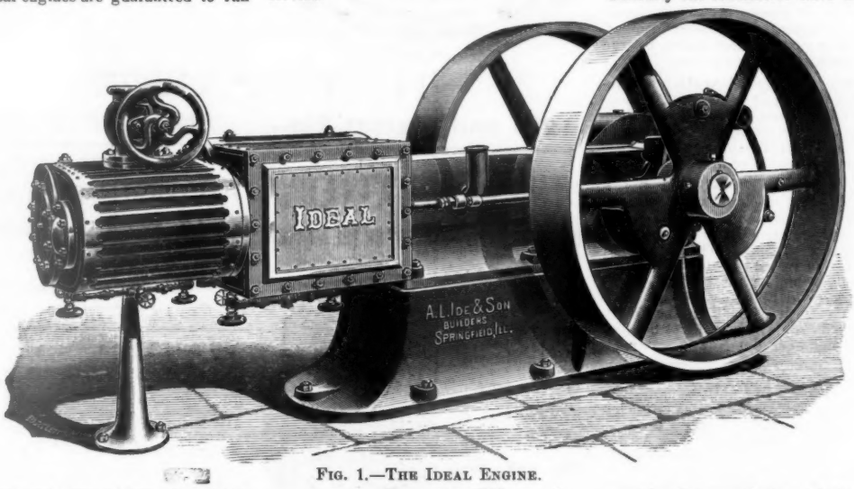


FIG. 1.—THE IDEAL ENGINE.

An Expensive Bid.

Bidders for county contracts usually inclose $500 in their bids. The Easton Electric Company, of New York, did this when they proposed to sell to Cook County, Illinois, a dynamo for the insane asylum. When bids are rejected the $500 is returned. After the Easton Company's bid was rejected, Superintendent of Public Service Hyland, of Chicago, is said to have introduced to Comptroller Dan Healy a man named Matthews, who once represented the firm in that city, and Mr. Healy believes he paid this man the money. The company now claims it never got the money. Hyland says he never introduced Matthews. Matthews says he did not get the money, and the comptroller wants to know who did get it.

Export Trade.

A representative of the Thomson-Houston Electric Companies has expressed himself as follows:

"America is furnishing Europe with all her electrical machines. We are at present lighting Paris by electricity, and a short time ago the Midland Railway of England bought $300,000 worth of dynamos and lamps from us for the purpose of lighting up its stations. And there, by the way, is something hard to understand. You know, as financiers, there is no nation in the world so astute as the English, but they seem to be very chary of speculating in electrical products. It is hard for an Englishman to believe that street cars can be run by electricity, and when he first saw the electric light, he shook his head doubtfully and declared it could not last. I guess it's the stolid, conservative nature of the Briton that causes him to think lightly of the value of electricity."

Progress of the Giant Ferranti Dynamo.

Mr. W. S. Malcolm gives the following account of the casting of the first of the 23-ton castings which are to form the feet of the magnet frames of the 10,000 horse-power Ferranti dynamo for Deptford station, which feet will have to carry the whole weight of the frames, amounting to many hundred tons: "As these measure some 12 feet by 10 feet by 6 feet 6 inches, and have each cast into their body the projecting ends of 11 magnets or blocks of soft iron, 3 feet 3 inches by 1 foot 6 inches by 5 inches, and weighing in all about 4½ tons, some idea may be formed of the nature of the casting. The greatest difficulty the contractors have had to overcome in the manufacture of these magnet frames has been the securing into the casting in a thoroughly fast and trustworthy manner of these large blocks of soft iron, this being absolutely necessary owing to the nature of the forces brought to bear on the magnets when the dynamos are at work. Possibly, owing to the very unusual nature of the casting, the same difficulty may not previously have presented itself to founders in any case. All the ordinary methods of casting failed to secure the desired end, and very special and novel treatment indeed has had to be resorted to before a satisfactory solution of the difficulty has been found. What in ordinary circumstances would form the main core of the mould has built into its interior a light steel tank of the necessary form and dimensions to suit the magnets, and into this vessel the magnets project for about two feet of their length. You have thus at once a core fulfilling all the ordinary functions of such, and at the same time in itself a water-tight vessel surrounding the magnets. After the metal has been run into the mould and allowed to set, cold water is immediately passed through the tank or vessel or caused to circulate round the magnets, but not in contact with the cast iron, for a period of from two to four days.

After this time, and during which the cast iron has been kept warm as long as possible, it is found that the magnets are firmly bound into the casting and practically form a part of it. As the contractors have already cast over twenty 12¾-ton castings on the same principle, only applied somewhat differently, the process may be said to have been subjected to a thorough test. In closing, I may state that the above process was introduced specially for the occasion, and has since been patented by me."

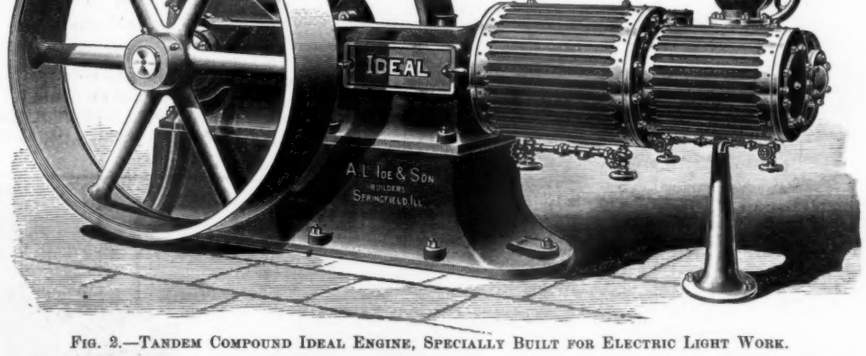


FIG. 2.—TANDEM COMPOUND IDEAL ENGINE, SPECIALLY BUILT FOR ELECTRIC LIGHT WORK.

Some Telegraph Experiences.

"I remember one morning, about four o'clock," says a western telegrapher, "while I was at work, a comely maiden of 19 or 20 Summers came and stood at the window watching me intently while at work. She was evidently of rural extraction and was rather an intelligent looking person. She finally said she wanted to send a telegram to a young man at Connersville, and, as she dictated the message, it was evident to me he was, so far as she was concerned, the only really and truly in this wide world and that all others were base imitations. She came in and sat down while I sent it. After finishing the despatch I threw the copy into a drawer. She still sat there. She had already told me she lived in Illinois and was going to Connersville to be married that afternoon. After half an hour or more of silence, she asked me if the message had gone. I told her that it had.

"She insisted that it had not; that she had seen me, with her own eyes, throw it into that drawer, and it was there yet. I tried to explain how messages were sent by telegraph, but she couldn't understand. Finally, she asked me for my name; if it wasn't all right, if her affianced didn't get the message, why, I would hear from her, that was all. I wrote my address on a piece of paper and was glad to see her depart. I have reason to think the young man received the message in good time and that everything went off satisfactorily, as two days later I received a package from Connersville containing several generous slices of wedding cake.

"Another time, during a State fair, a man 28 or 30 years old and about six feet two inches high, came up with a pair of boots under his arm and wanted to know how much it would cost to send the old pair back to Amb, a little town in Hendricks county. 'I 'lowed,' said he, 'ef it wasn't too much, I'd just telegraph 'em back. Y' see, I'm goin' be to the fair three days, and don't keer to be bothered with 'em.'"

Against the Single Trolley.

The Ohio Court of Appeals, which consists of three members, has decided, two to one, in favor of the decision of Judge Taft, of Cincinnati, which was in favor of the telephone company of his city. It will be remembered that the Cincinnati telephone people brought suit against the electric railway company, which was using the single trolley system, to compel them to change to the double trolley, and thus obviate induction troubles. Judge Taft decided as above and gave the electric railway people nine months to make the change. On appeal to the highest court of the State, Judge Taft's decision was affirmed.

This decision will undoubtedly have great influence in other suits of a similar nature.

In Albany, New York, Wednesday night of last week, a slight sleet storm broke down a number of telephone wires, and some 20 switchboard drops were burned out and several others damaged by the wires coming in contact with the single trolley wires of the electric railway. Had not General Manager Uline realized the danger and kept his force of linemen at work all night clearing the wires, the damage would have been much greater.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENTS OF THE UNITED STATES WERE ISSUED ON DECEMBER 2, 1890.

441,665 Regulator for electric motors; Walter E. Hyer, Newburgh, N. Y.

441,695 Brush holder for electric motors or dynamos; William S. Patterson, Allegheny, Pa.

441,703 Electric signaling system; Joseph W. Riggs, Minneapolis, Minn., assignor to the Riggs Electric Traveling Danger Signal Co., same place.

441,764 Trolley covering for electric railways; Hiram Jones, Detroit, Mich.

441,771 Gearing and motor-supporting mechanism for electric locomotives; Frank Mansfield, New York, N. Y.

441,773 Automatic electric railway signal; Robt. O. Owen, Lynchburg, Va.

441,793 Dynamo electric machine; Walter K. Freeman, Brooklyn, N. Y., assignor to William S. Hadaway, Jr., trustee. Boston, Mass.

441,794 Regulator for dynamo electric machines; Walter K. Freeman, Brooklyn, N. Y., assignor to William S. Hadaway, Boston, Mass.

441,800 Trolley wire hanger or support; Edw. H. Kitfield, Lynn, assignor of two-thirds to Herbert C. Wirt and James L. Kimball, both of Boston, Mass.

441,807 Motor regulator; David Pepper, Jr., Philadelphia, Pa., assignor to himself and Harry G. Clay, Jr., same place.

441,817 Electro-thermostatic valve; Louis Bell and Frank H. Root, Chicago, Ill.

441,818 Electrode for secondary batteries; Jos. Y. Bradbury and Frank J. Stone, Lowell, Mass.

441,828 Electro-magnetic traction-increasing system; Mark W. Dewey, Syracuse, N. Y., assignor to the Dewey Corporation, same place.

441,837 Conduit for electric conductors. 441,838 Attaching device for electric conductors. 441,840 Underground conduit for electric wires; Edwin T. Greenfield, New York, N. Y., assignor, by mesne assignments, to the Interior Conduit and Insulation Co.

441,839 Process of impregnating porous bodies; Edwin T. Greenfield and Junius Nagel, New York, N. Y., assignors, by mesne assignments, to the Interior Conduit and Insulation Co.

441,843 Galvanic battery; Albert H. Hoy, Racine, Wis.

441,847 Telegraph circuit; Francis W. Jones, New York, N. Y.

441,849 Electric line hook; Fred. M. Locke, Victor, and John Lapp, Rochester, assignor of one-third to Theodore M. Morton, Victor, N. Y.

441,855 441,856 Thermostat; Arthur G. Sargent, East Tilton, assignor of one-half to the Laconia Car Co., Laconia, N. H.

441,877 Incandescent lamp fixture; Frederick Lewis, New Haven, Conn., assignor to John C. English, same place.

441,892 441,893 Apparatus for electroplating. 441,894 Apparatus for electroplating carbons or other articles; William J. Possons, Cleveland, O., assignor to the Brush Electric Co., same place.

441,908 Electric clock alarm; Matthias W. Tiedemann, Brooklyn, N. Y.

441,918 Rheostat; Timothy K. Ames, Wilmington, Del., assignor of one-half to James D. Carter, same place.

441,919 Electric wire coupling; William E. Banta, Springfield, O.

441,933 Thermal cut-out; David J. Cartwright, Boston, Mass., assignor to the Electrical Safety Co., Portland, Me.

441,953 Electric motor. 441,954 Method of operating electric motors; Henry Groswith, Philadelphia, Pa., assignor, by direct and mesne assignments, to the Kennedy-Groswith Electric Co., same place.

441,958 Secondary battery; Chas. W. Kennedy and Henry Groswith, Philadelphia, Pa., assignors to the Kennedy-Groswith Electric Co., same place.

441,959 Electrode for secondary batteries; Chas. W. Kennedy, Philadelphia, Pa., assignor, by direct and mesne assignments, to the Kennedy-Groswith Electric Co., same place.

441,967 Galvanic battery; Candido G. de Peralta, Havana, Cuba.

441,972 Electrical indicating apparatus for linear measure. 441,973 Electrical location and range finding instrument. 441,974 Method of finding the range of distant objects. 441,975 Indicator for range finders; John Rapieff, New York, N. Y.

441,999 Lightning arrester; James J. Wood, Brooklyn, N. Y.

442,002 Moving contact for electric railways; Arthur W. Adams, Kansas City, assignor of one-half to Francis E. Nipher, St. Louis, Mo.

442,018 Electric arc lamp; Thomas P. C. Crampton, London, England, assignor of one-half to Albert Essinger, same place.

442,029 Annunciator. 442,030 Electric switch; Frank E. Fisher, Detroit, Mich.

442,071 Guard for incandescent electric light globes; Joseph Mino, Denver, Col.

KINDRED INTERESTS.

James H. Mason, 118 and 120 Park avenue, Brooklyn, has an interesting exhibit of his primary batteries in the Fulton Street Arcade, Brooklyn.

The Bridgeport Machine Tool Works have sent us a very handsome catalogue of their products. It is of a convenient form, with a green and gold cover. The illustrations are profuse and good.

Watson & Stillman, 204 to 210 East Forty-third street, New York, have issued one of the most complete catalogues of hydraulic jacks ever published. There are upwards of 100 different sizes and styles of jacks illustrated and described.

H. T. Paiste, Twelfth and Market streets, Philadelphia, has one of the best arranged and most convenient switch manufactories in existence. The constant demand for the Paiste snap-switches keeps a large force of workmen busy at all times.

The Electric Merchandise Company, 11 Adams street, Chicago, have supplied about 75 electric railways with their noiseless raw-hide pinions, and are in receipt of some very complimentary testimonials from companies who have used them.

W. H. Gordon & Co., 115 Broadway, have taken the general selling agency for the Star Electrix switches, sockets, cut-outs, etc., and are prepared to quote dealers and consumers of same. The business of this firm has increased wonderfully within the last year, owing largely to their energy and promptness in filling orders. Mr. Gordon recently spent a week in the West, where he made some large sales of Simplex wire, for which he is the New York agent.

INVENTORS

Coming to Washington to further any electrical patents, will profit by calling on **C. W. Messner, of 609 12th St., N. W.** All the appliances necessary for tests, experiments, etc. Also, Electrical Contractor and Constructor. Special attention to isolated plants. Agent for the "C. & C." electric motor—sizes, ¼ to 50 horse-power. The only electric motor on the market to-day.

YOU make a mistake if you don't buy your Electrical Supplies from F. & F., Cleveland, O.

LOOK AT THESE PRICES:

$2 Electric Bells, 50c., 75c. Bronze.
Push Buttons, 25c.; 35c. Wood Push.
Buttons, 7c.; 50c. Switches, 15c
40c. Bell Hangers' Staples, per lb., 10c.
$1 Leclanche Batteries, 45c.
$1 Carbon Batteries, 40c.
$3.75 Spark Coils, $1.50; $10 Medical Batteries, $3.50.
Dry Batteries, Motors, Dynamos and Annunciators at half price. Send for reduced price list and discounts.

Fletcher & Fletcher Electric Co., Cleveland, O.

MUNICIPALITY OF BOMBAY.

ELECTRIC LIGHTING.

NOTICE.

SEALED TENDERS will be received by the MUNICIPAL COMMISSIONER for the City of Bombay up to 1 P. M., on Monday, the 16th day of February, 1891, for experimental lighting by Electricity of certain streets of the City of Bombay for a period of two years.

2. Forms of tender and schedule of conditions and a sketch of the portion of the City showing the streets to be lighted may, on payment of Five Dollars, be obtained from CHARLES HALLETT CLARK, Washington Building, No. 1 Broadway, Rooms 209 and 210, New York, who will, on application, give any further information that may be required.

3. Tenders must be accompanied by a deposit of Rupees One thousand in cash (not to bear interest) or in Public Securities for that amount, to be paid to the Chief Accountant of the Municipality of Bombay, which will be forfeited to the Corporation in case of refusal to sign the Contract embodying the conditions mentioned in the Schedule above referred to.

4. A further payment to make the total deposit equivalent to 5 per cent on the contract amount will have to be made by the Tenderer, whose tender may be accepted before signing the Contract.

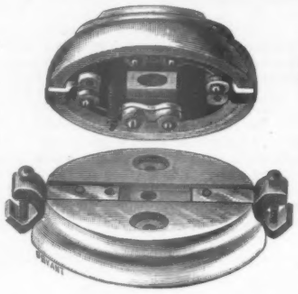
5. The Municipal Commissioner does not bind himself to accept the lowest or any tender.

By order of the Municipal Commissioner,
RIENZI WALTON,
Executive Engineer, Municipality.

EXECUTIVE ENGINEER'S OFFICE,
BOMBAY MUNICIPALITY,
BOMBAY, 13th October, 1890.

5,000

PAISTE PORCELAIN PENDANT CUT-OUTS IN STOCK



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SAMPLES FORWARDED FREE.

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IS THE CHEAPEST BATTERY ON THE MARKET.

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We make a specialty of Pure Zinc and Pure Sal-Ammoniac.

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ELECTRIC AND STREET RAILWAY PROPERTIES BOUGHT AND SOLD.

WANTED.—A practical and theoretical electrician to superintend and operate electrical mining plant. Must give good references.

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CARE OF ELECTRICAL REVIEW, N.Y.

"I advise all parents to have their boys and girls taught shorthand writing and typewriting. A stenographer who can typewrite his notes would be safer from poverty than a great Greek scholar."—CHARLES READE, on "The Coming Man."

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For 15 years the Standard, and to-day the most perfect development of the writing machine, embodying the latest and highest achievements of inventive and mechanical skill. We add to the Remington every improvement that study and capital can secure.

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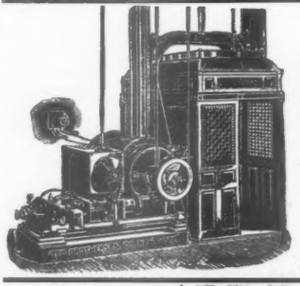

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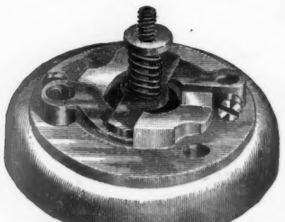

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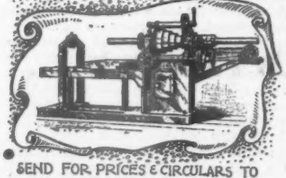

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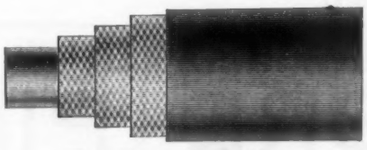

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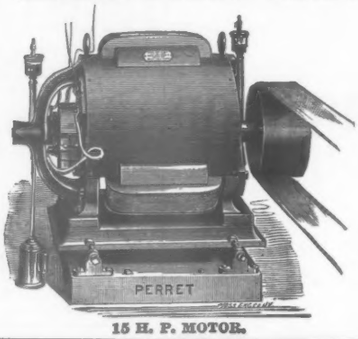

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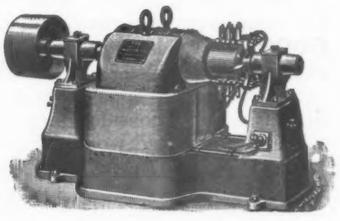

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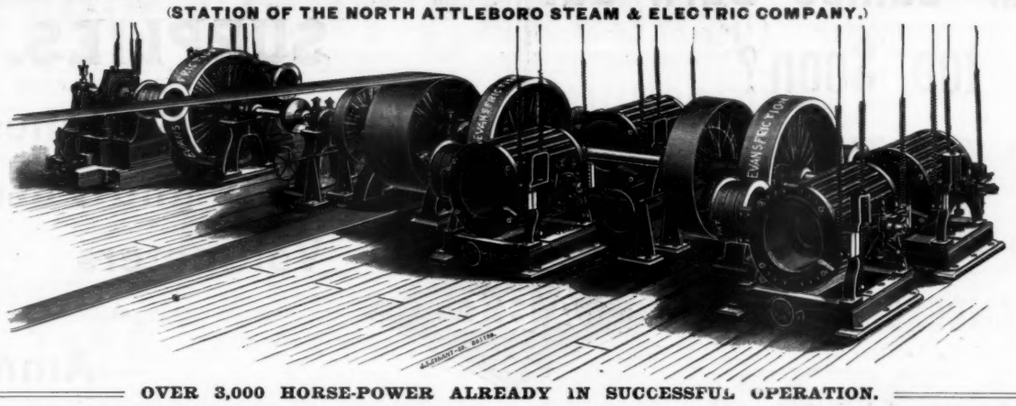

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							5,000 FEET PER MINUTE.	
C	8	.....	.....	.....	6.5	1¼		530
C	.....	10	.....	.....	6.3	1⅛		530
C	.....	.....	.....	25	8.0	2		530
E	16	.....	.....	.....	12.0	2½		780
E	.....	20	.....	.....	12.5	2½		780
E	.....	.....	26	.....	13.0	2½		780
E	20	.....	.....	.....	15.0	3		990
E	.....	25	.....	.....	15.6	3		990
E	.....	.....	32	.....	15.0	3		990
F	.....	.....	.....	50	16.0	3		990
G	28	.....	.....	.....	21.0	4½		1,360
G	●	.....	.....	.....				

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							5,000 FEET PER MINUTE.	
D	.....	35	.....	.....	21.0	4		1,360
D	.....	.....	45	.....	21.0	4		1,360
D	.....	.....	.....	70	21.0	4½		1,360
H	40	.....	.....	.....	29.7	6		1,750
H	.....	50	.....	.....	30.0	6		1,750
H	.....	.....	64	.....	29.5	6		1,750
I	52	.....	.....	.....	38.0	8		2,290
I	.....	65	.....	.....	38.6	8		2,290
I	.....	.....	83	.....	38.0	8		2,290
J	64	.....	.....	.....	46.5	10		2,770
K	.....	80	.....	.....	47.1	10		2,770
K	75	.....	.....	.....	52.5	12		3,300

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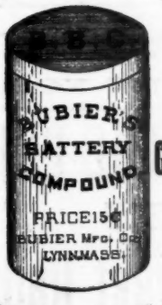

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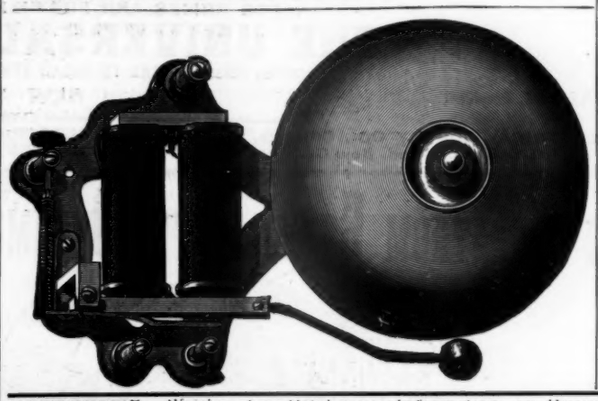

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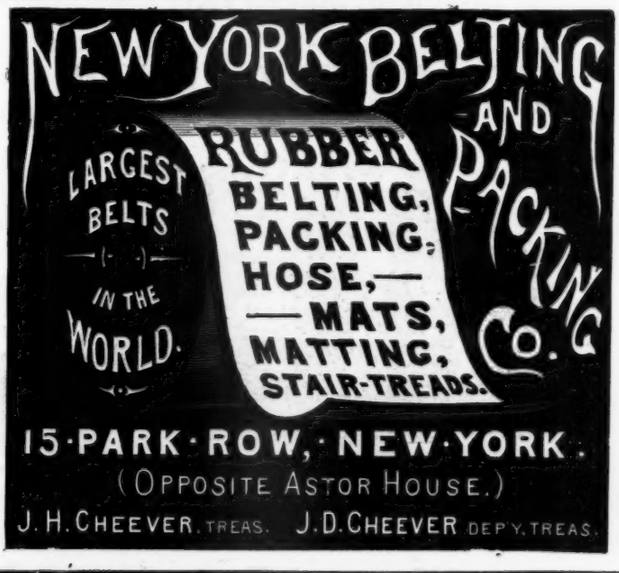
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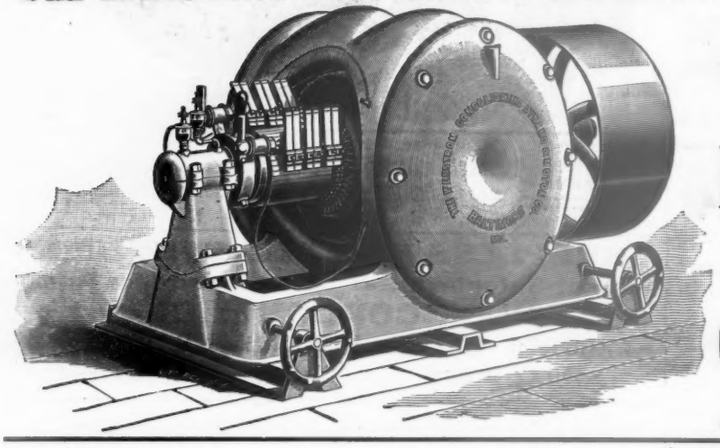

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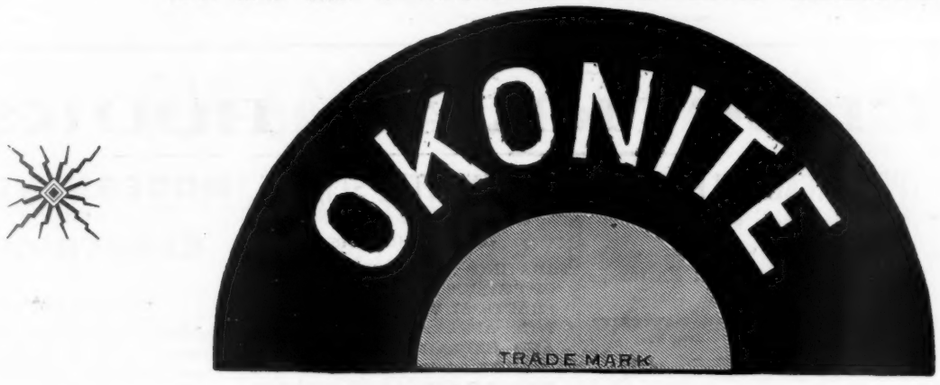

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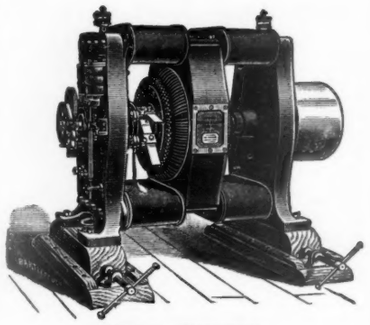

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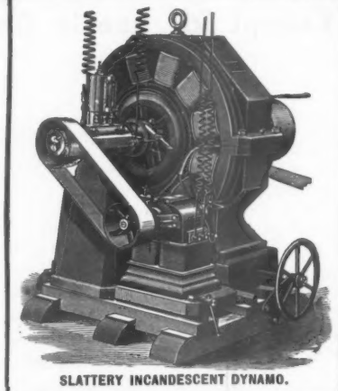

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1 is a washer made of a composition practically non-oxidizable, and which cannot be corroded by the battery salts. A like washer is on the other side of the carbon. Through these two washers and the carbon runs a screw made of zinc.

2 is a zinc nut placed on the screw and turned up tight against the washer **1**, to bind the whole tightly to the carbon.

3 is a connecting strip of flexible metal, not subject to oxidation or corrosion, which is placed upon the zinc screw for the purpose of connecting the carbon pole of one cell to the zinc of another.

4 is a zinc washer to prevent the strip **3** from being twisted when the nut **5** is screwed up.

5 is a zinc nut to be screwed up tight against the washer **4**, to bind the connection, and

6 is a check nut of zinc to reinforce **5**.

The screws on both carbon and zinc are of the same size and thread, and the nuts on both are alike and interchangeable. No local action is possible between the carbon and the zinc screw, because they do not touch, the electrical contact being made through the non-oxidizable washers.

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NOTICE TO CONTRACTORS.

OFFICE OF CITY CIVIL ENGINEER,
INDIANAPOLIS, IND., Dec. 4, 1890.

Notice is **hereby given that sealed** proposals will be received by the common council of the city of Indianapolis on Monday, Jan. 5, 1891, for lighting the city of Indianapolis, Ind.

FOR ELECTRIC LIGHT.

Proposition to be for 400 lights; for 500 lights; for 600 lights; for 700 lights, and for 800 lights, all to be 2,000 standard candle-power arc lights, suspended on mast arms.

All bids to be made to comply with provisions of general ordinance No. 41, 1888, of this city, providing for the placing of all electric light wires within North, South, East and West Sts. to be laid underground, outside of which boundaries wires may be strung on poles.

The contractor to furnish all necessary material, and do all the work of whatever kind necessary to construct, equip and maintain good and substantial electric installation, complete and ready for operation for lighting the city, and when the same is completed shall operate the same in its entirety for a trial period of sixty (60) days.

The lights furnished shall be as good as the best standard 2,000 candle-power lights used in any city in the United States.

At the end of the trial period, if the lights are as good as above specified, and should the performance of the entire plant prove satisfactory, the city will accept the same, and the rental shall date from the beginning of the trial period. But should the performance of the entire plant not be satisfactory to said city, the plant will not be accepted, and no rent will be paid until said plant is made, in its entirety, perfectly satisfactory to said city.

The equipment must in all respects be of the best manufacture and of the latest and most approved design.

Bidders to make their propositions upon the basis of an all night lighting schedule, begining one-half hour after sunset and ending one-half hour before sunrise; also on a basis of a five years' and also on a ten years' contract. Lights to be located under the direction of the committee on public light of the common council, and board of aldermen and the city civil engineer.

The plant will consist of an equipment capable of operating and sustaining circuits upon which to operate arc lights 2,000 standard candle-power each.

Not more than 50 lamps to be lighted by any one circuit.

The mean photometric candle-power of the lights, measured at an angle of 45 degrees from a horizontal, shall be as great as that shown by the best standard 2,000 candle-power arc light now in use in the United States.

All intermediate points shall be straight, live white cedar, shaved, not less than six inches in diameter at the top, and shall not be less than 30 (30) feet in length, to be set five (5) feet in the ground.

All poles, including cross arms, pins and brackets to be painted two coats of good paint of such color as the city engineer may designate.

All poles to be set plumb, true to line, and guyed whenever direction changes or otherwise necessary.

Poles to be set not more than 140 feet apart in any case, and estimated at the rate of 40 poles per mile.

All wires must be thoroughly insulated with some good material not easily abraded and impervious to moisture, and the insulation to be guaranteed water and weather-proof for three years. All joints to be soldered, and covered with at least five layers of Kerite tape, or some other non-conducting material equally as good.

When the direction changes an insulated loop guard shall be attached to the pole to hold the wire, in case of breaking of pin or brackets. Wires must, in all cases, clear the ground at least 25 five feet and must be kept clear of contact with any adjacent lines or wires. Insulation from grounding from outside contacts must be perfect.

All wiring and other work shall, in addition to the above, be done according to the rules and regulations of the "National Board of Underwriters."

The contractor will be required to enter into a written contract agreeing to perform the whole work according to the true intent of the above specifications, and shall state the time within which he will do the whole of said work and have the plant in operation; said time shall not exceed six months after the date of signing the contract.

The contractor shall be required to furnish a bond with satisfactory sureties protecting the city from liability on account of infringements of patents or otherwise, and also from all damages and costs of suits that may arise on account of construction, maintenance, rental, use, or ownership by the city, and guaranteeing the full and faithful compliance with all the terms of this contract with the city.

All work to be done under the direction and supervision of the city civil engineer, and any points omitted in the above specifications shall be subject to directions given by him from time to time during the progress of the work.

The contractor will be required to accompany his bid with a certified check for five thousand dollars ($5,000), payable to the mayor of said city of Indianapolis, Indiana, for said city, and the amount thereof shall be retained by said city of Indianapolis, as liquidated damages in the event of his failing to enter into a contract, and file proper bond within ten (10) days from date of award of contract, and to be returned to said contractor upon his filing a good and sufficient bond within such time for the faithful performance of the contract. The contractor to erect the plant as above, furnishing all the necessary appliances and doing all the work of constructing and operating and maintaining the same, and to furnish lights as above specified for a given sum per light per annum.

The rental to be paid monthly.

The city shall be granted the option of purchasing at the expiration of the contract period, the entire plant of any contracting company, at a price that shall be fixed by a board consisting of five members, two to be selected by each of the contracting parties, and the fifth to be selected by said four members so selected by said contracting parties. The city shall give to said contracting company six months' notice, immediately prior to the expiration of any such contract, of the city's intention to purchase the plant.

The common council and board of aldermen reserve the right to reject any and all bids.

FOR GAS LIGHTS.

For bids to furnish gas lights as follows: Five hundred lights, 1,000 lights, 2,000 lights, 3,000 lights, 4,000 lights.

FOR VAPOR LIGHTS.

For vapor lights as follows: Three hundred lights, 400 lights and 500 lights.

Bidders for furnishing gas or vapor lights, or both, to bid on a basis of one, two and three years contracts, and shall each submit with their bids certified checks for $2,000, guaranteeing faithful compliance of their contracts. All bidders for electric, gas or vapor lights shall bid on a basis of an all night lighting schedule, and for the lighting, cleaning and repairing of their respective lights. All additional lights to be provided at the contract price. The city reserves the right to reject any and all bids.

A. P. SHAWVER,
City Civil Engineer.

MUNICIPALITY OF BOMBAY.

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NOTICE.

SEALED TENDERS will be received by the MUNICIPAL COMMISSIONER for the City of Bombay up to 1 P. M., on Monday, the 16th day of February, 1891, for experimental lighting by Electricity of certain streets of the City of Bombay for a period of two years.

2. Forms of tender and schedule of conditions and a sketch of the portion of the City showing the streets to be lighted may, on payment of Five Dollars, be obtained from CHARLES HALLETT CLARK, Washington Building, No. 1 Broadway, Rooms 209 and 210, New York, who will, on application, give any further information that may be required.

3. Tenders must be accompanied by a deposit of Rupees One thousand in cash (not to bear interest) or in Public Securities for that amount, to be paid to the Chief Accountant of the Municipality of Bombay, which will be forfeited to the Corporation in case of refusal to sign the Contract embodying the conditions mentioned in the Schedule above referred to.

4. A further payment to make the total deposit equivalent to 5 per cent on the contract amount will have to be made by the Tenderer, whose tender may be accepted before signing the Contract.

5. The Municipal Commissioner does not bind himself to accept the lowest or any tender.

By order of the Municipal Commissioner,
RIENZI WALTON,
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BOMBAY MUNICIPALITY,
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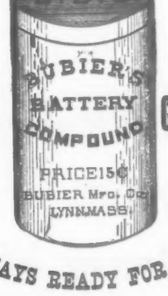

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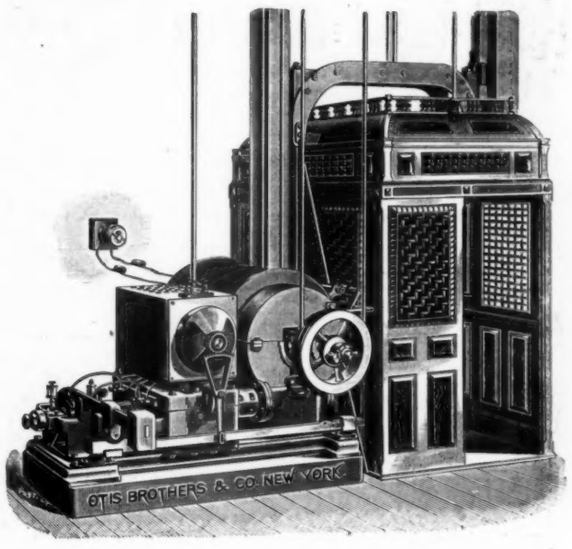

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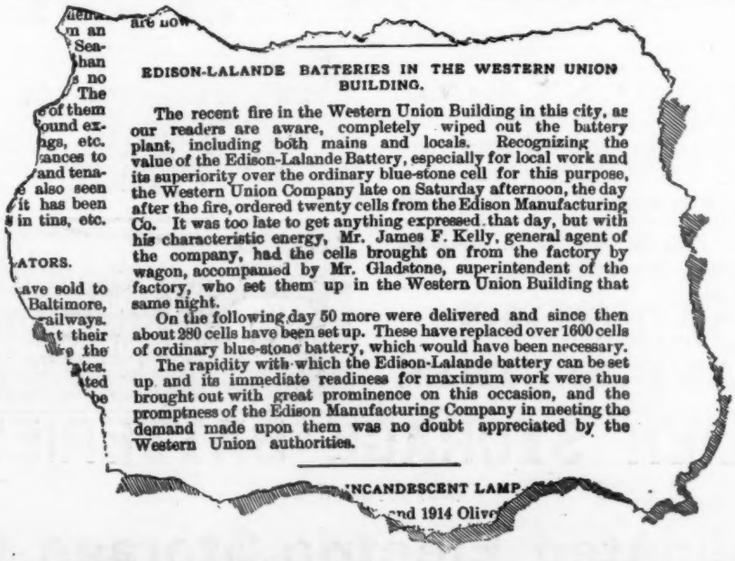

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The recent fire in the Western Union Building in this city, as our readers are aware, completely wiped out the battery plant, including both mains and locals. Recognizing the value of the Edison-Lalande Battery, especially for local work and its superiority over the ordinary blue-stone cell for this purpose, the Western Union Company late on Saturday afternoon, the day after the fire, ordered twenty cells from the Edison Manufacturing Co. It was too late to get anything expressed that day, but with his characteristic energy, Mr. James F. Kelly, general agent of the company, had the cells brought on from the factory by wagon, accompanied by Mr. Gladstone, superintendent of the factory, who set them up in the Western Union Building that same night.

On the following day 50 more were delivered and since then about 280 cells have been set up. These have replaced over 1600 cells of ordinary blue-stone battery, which would have been necessary.

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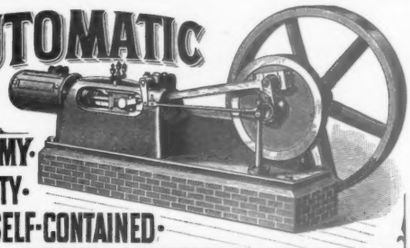

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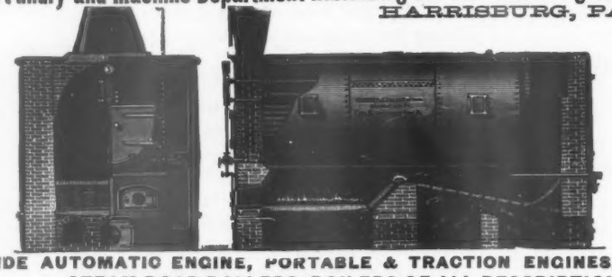

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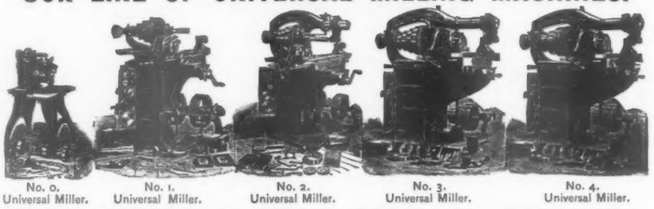

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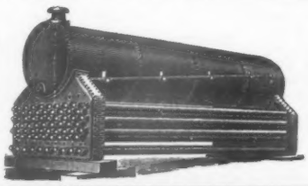

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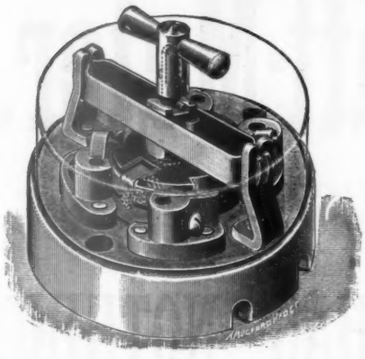

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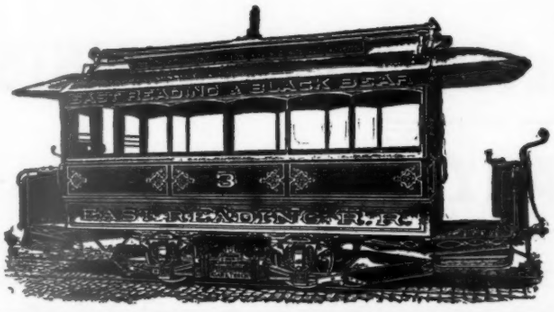

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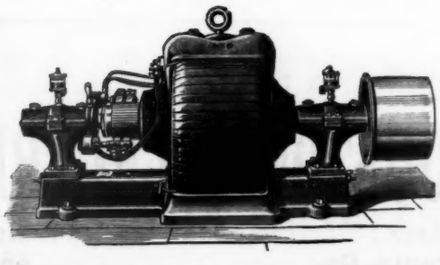

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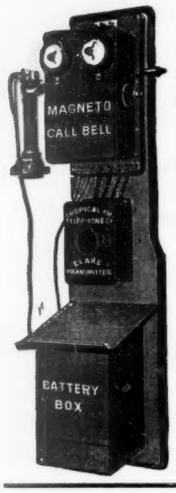

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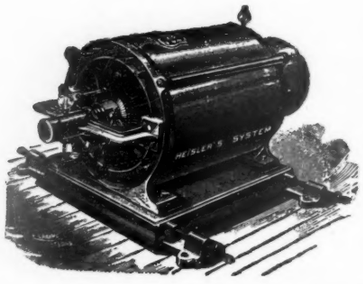

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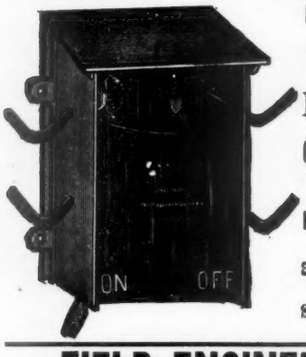

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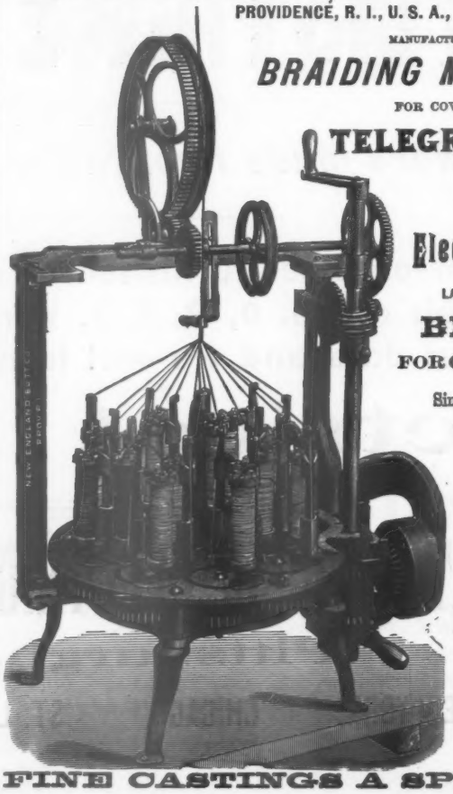

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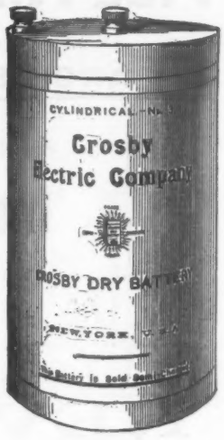

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**Intended for Close Circuit Work.
Will Not Polarize.
Pure Water only Necessary to Charge It.
The Simplest and Cleanest Close Circuit Battery in the World.**

**No Fumes.
No Odor.**

**For Small Motors.
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For Doctors' and Dentists' Use.

Induction Coils, Etc., and all purposes where a Constant Current is required for continuous or intermittent work.